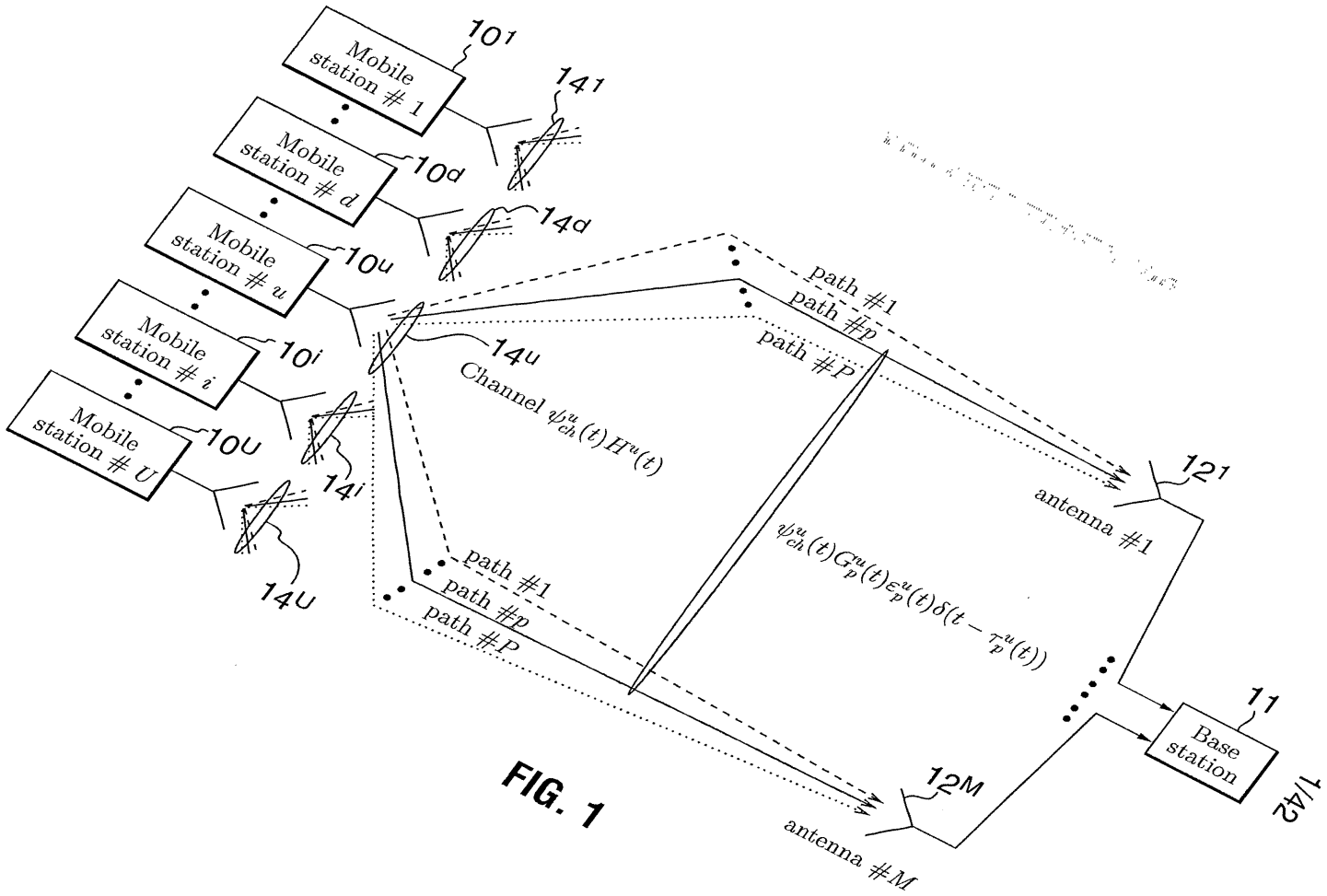

Mobile station # 1
Mobile station # d
Mobile station # u
Mobile station # i
Mobile station # U
10¹
10ᵈ
10ᵘ
10ⁱ
10ᵁ
14¹
14ᵈ
14ᵘ
14ⁱ
14ᵁ
Channel $\psi^u_{ch}(t)H^u(t)$
path #1
path #p
path #P
$\psi^u_{ch}(t)G^u_p(t)\varepsilon^u_p(t)\delta(t-\tau^u_p(t))$
12¹
12ᴹ
antenna #1
antenna #M
11
Base station

FIG. 1

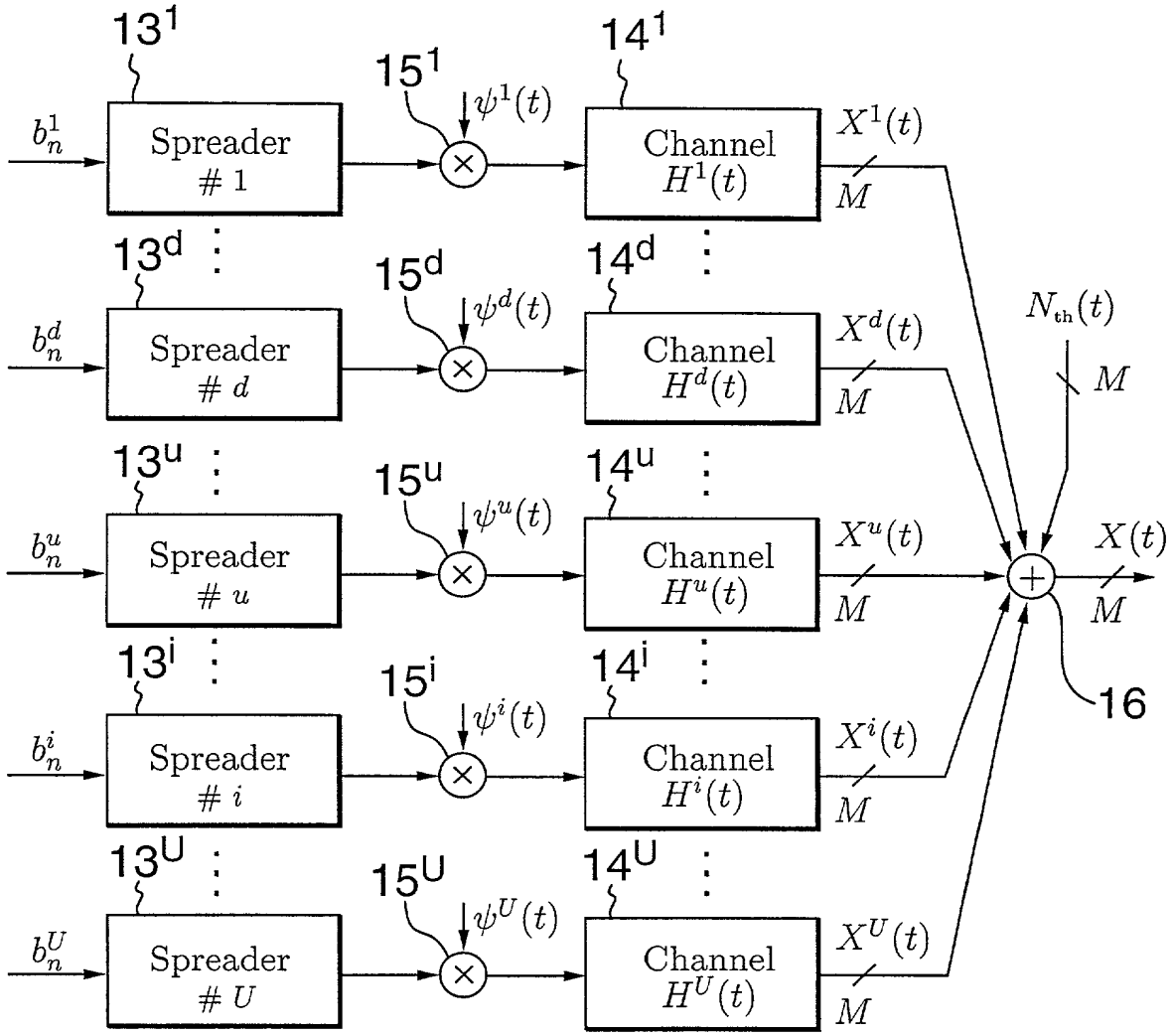

13^1
15^1
14^1
b_n^1
Spreader # 1
$\psi^1(t)$
Channel $H^1(t)$
$X^1(t)$
M
13^d
15^d
14^d
b_n^d
Spreader # d
$\psi^d(t)$
Channel $H^d(t)$
$X^d(t)$
M
$N_{th}(t)$
M
13^u
15^u
14^u
b_n^u
Spreader # u
$\psi^u(t)$
Channel $H^u(t)$
$X^u(t)$
M
$X(t)$
M
13^i
15^i
14^i
b_n^i
Spreader # i
$\psi^i(t)$
Channel $H^i(t)$
$X^i(t)$
M
16
13^U
15^U
14^U
b_n^U
Spreader # U
$\psi^U(t)$
Channel $H^U(t)$
$X^U(t)$
M

FIG. 2

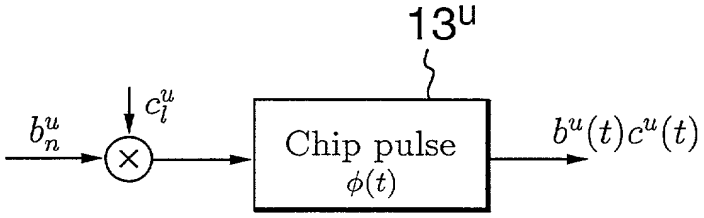


FIG. 3

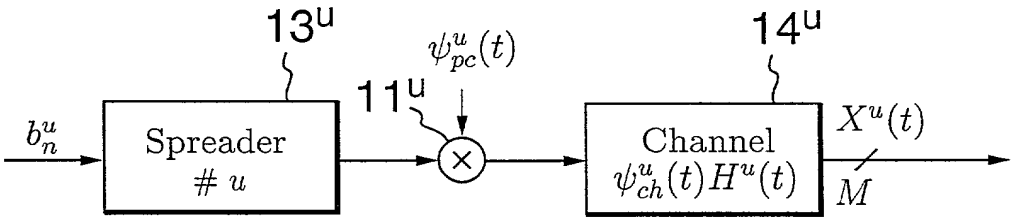


FIG. 4(a)

$\equiv$

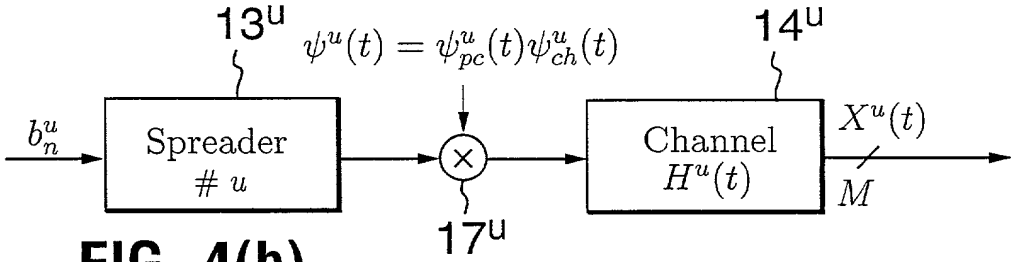


FIG. 4(b)

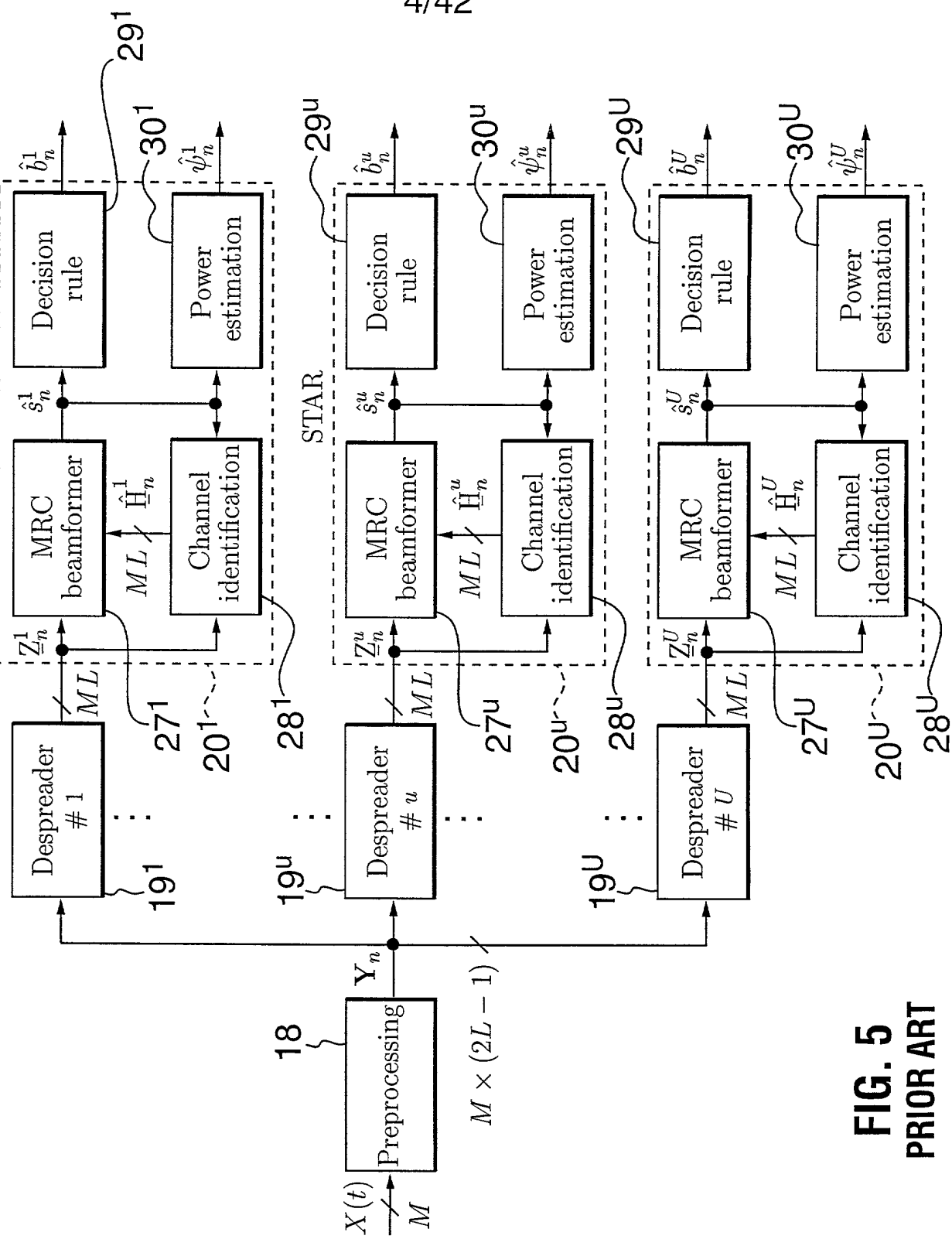


FIG. 5
PRIOR ART

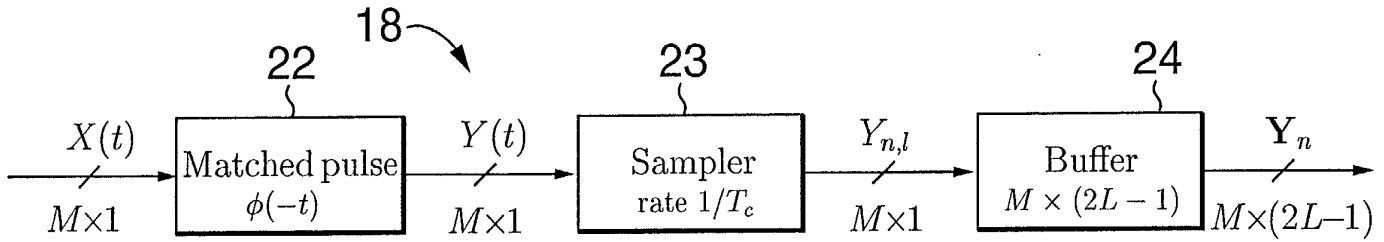


FIG. 6

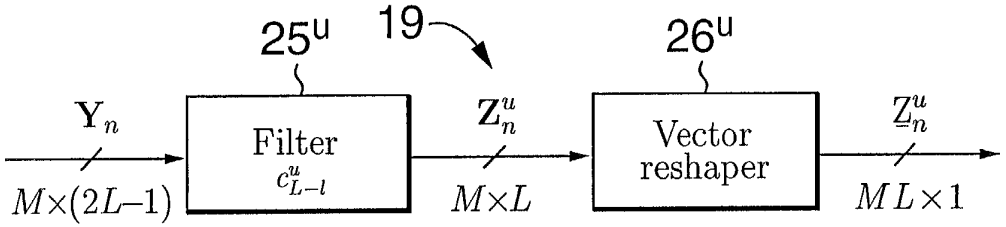


FIG. 7

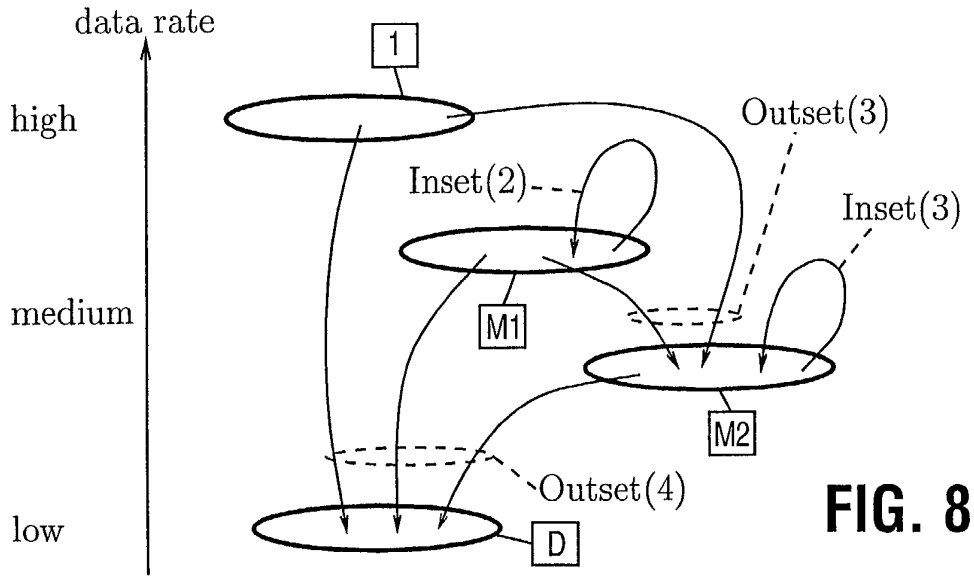


FIG. 8

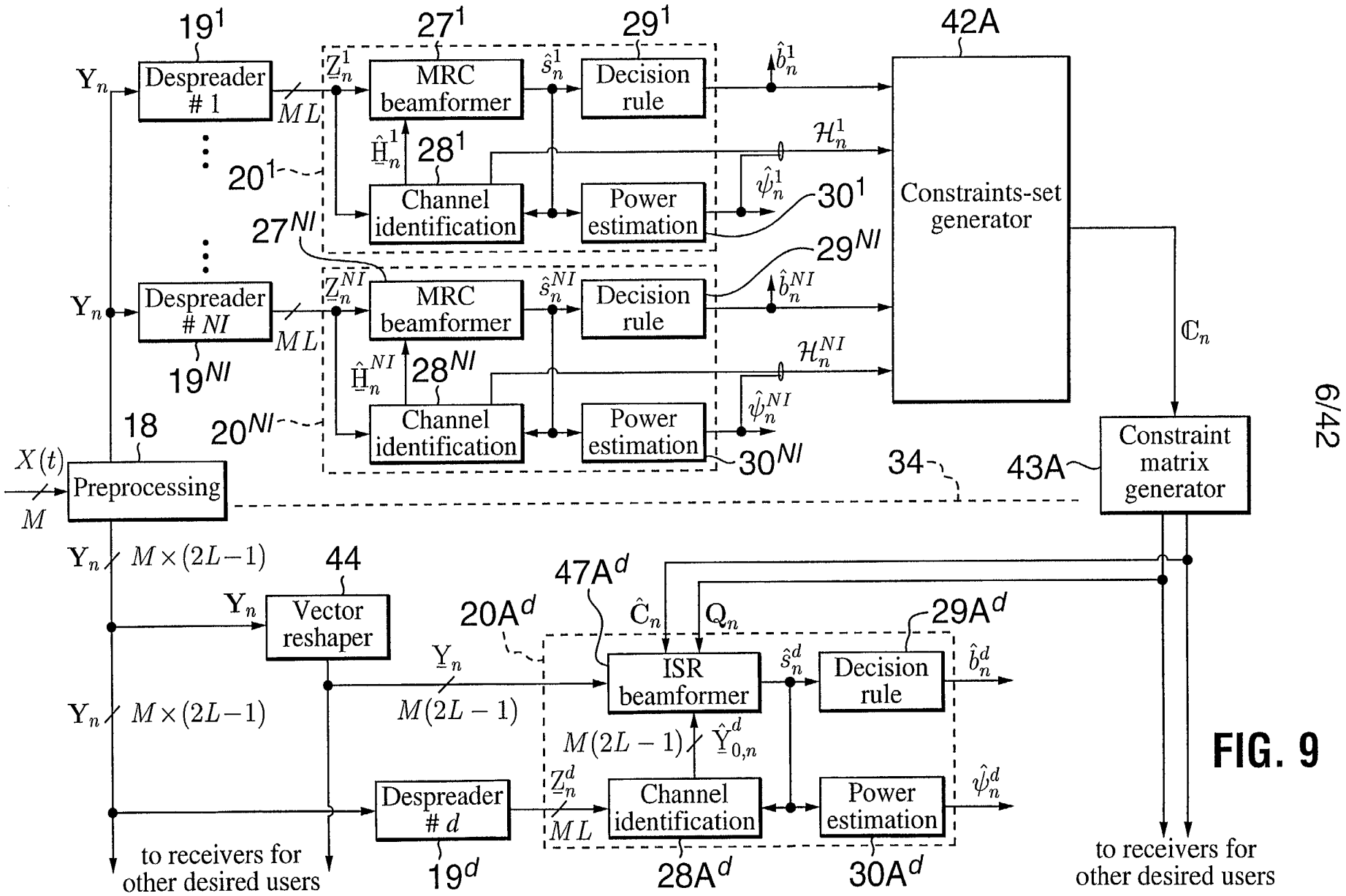

19^1
27^1
29^1
42A
Despreader # 1
MRC beamformer
Decision rule
Constraints-set generator
Channel identification
Power estimation
28^1
30^1
27^NI
29^NI
Despreader # NI
19^NI
MRC beamformer
Decision rule
28^NI
20^NI
Channel identification
Power estimation
30^NI
18
Preprocessing
34
43A
Constraint matrix generator
44
Vector reshaper
47A^d
20A^d
29A^d
ISR beamformer
Decision rule
Despreader # d
Channel identification
Power estimation
19^d
28A^d
30A^d
to receivers for other desired users
to receivers for other desired users

FIG. 9

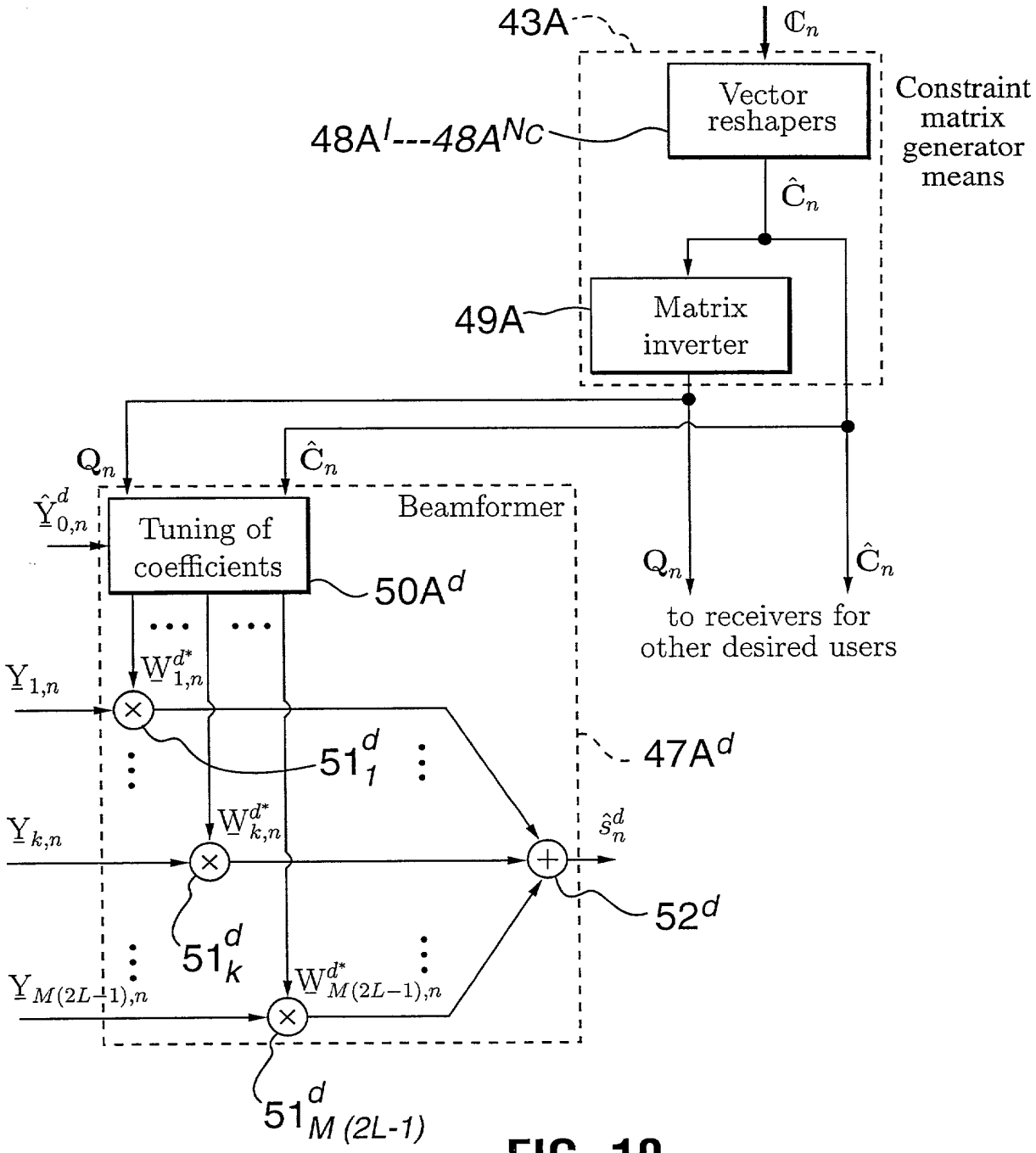

43A
$\mathbb{C}_n$
Vector reshapers
48A^1---48A^{Nc}
Constraint matrix generator means
$\hat{\mathbf{C}}_n$
49A
Matrix inverter
$\mathbf{Q}_n$
$\hat{\mathbf{C}}_n$
$\hat{\underline{Y}}^d_{0,n}$
Tuning of coefficients
50A^d
Beamformer
$\mathbf{Q}_n$
$\hat{\mathbf{C}}_n$
to receivers for other desired users
$\underline{Y}_{1,n}$
$\underline{W}^{d*}_{1,n}$
51^d_1
47A^d
$\underline{Y}_{k,n}$
$\underline{W}^{d*}_{k,n}$
$\hat{s}^d_n$
51^d_k
52^d
$\underline{Y}_{M(2L-1),n}$
$\underline{W}^{d*}_{M(2L-1),n}$
$51^d_{M(2L-1)}$

FIG. 10

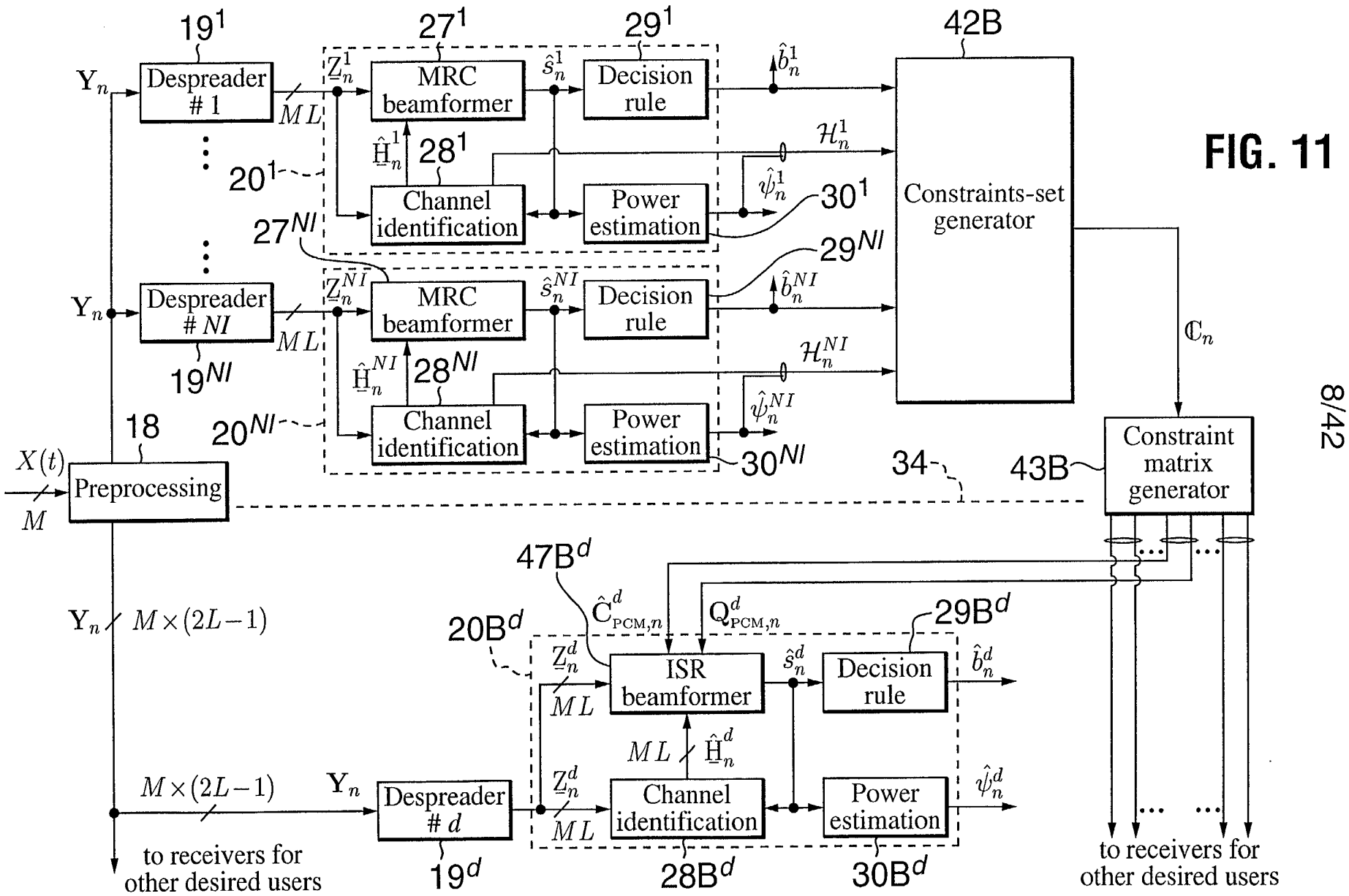

19^1
27^1
29^1
42B
Y_n
Despreader # 1
ML
Z_n^1
MRC beamformer
ŝ_n^1
Decision rule
b̂_n^1
Ĥ_n^1
28^1
20^1
Channel identification
Power estimation
ψ̂_n^1
30^1
ℋ_n^1
Constraints-set generator
27^NI
29^NI
Despreader # NI
19^NI
Z_n^NI
MRC beamformer
ŝ_n^NI
Decision rule
b̂_n^NI
Ĥ_n^NI
28^NI
20^NI
Channel identification
Power estimation
ψ̂_n^NI
30^NI
ℋ_n^NI
ℂ_n
18
X(t)
M
Preprocessing
34
43B
Constraint matrix generator
47B^d
Ĉ^d_PCM,n
Q^d_PCM,n
20B^d
29B^d
Y_n
M×(2L−1)
Z_n^d
ML
ISR beamformer
ŝ_n^d
Decision rule
b̂_n^d
Ĥ_n^d
Despreader # d
19^d
Channel identification
28B^d
Power estimation
30B^d
ψ̂_n^d
to receivers for other desired users
to receivers for other desired users

FIG. 11

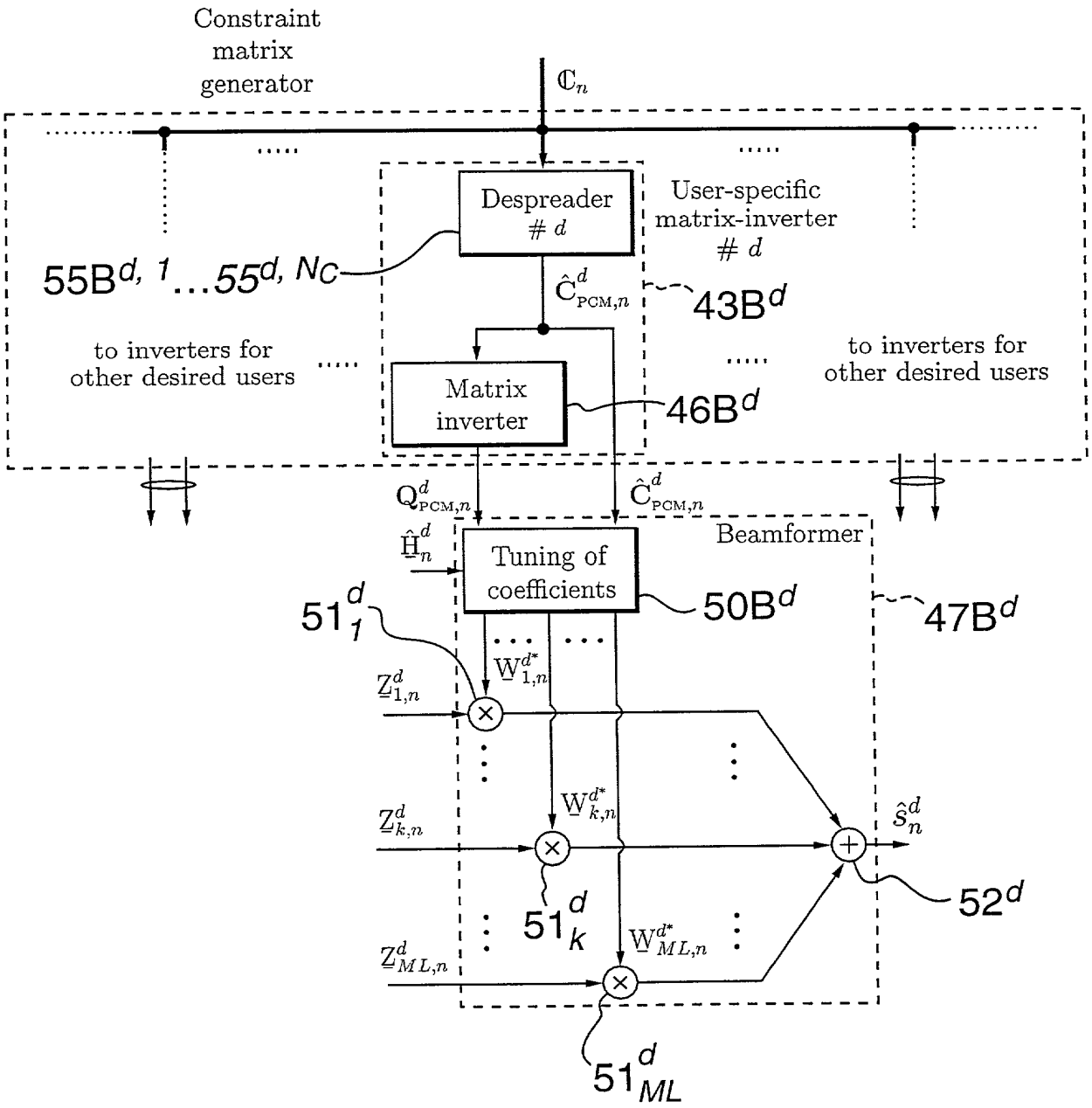

Constraint matrix generator
$\mathbb{C}_n$
Despreader # d
User-specific matrix-inverter # d
$55B^{d,1}...55^{d,Nc}$
$\hat{C}^d_{PCM,n}$
$43B^d$
to inverters for other desired users
Matrix inverter
$46B^d$
to inverters for other desired users
$Q^d_{PCM,n}$
$\hat{C}^d_{PCM,n}$
$\hat{H}^d_n$
Beamformer
Tuning of coefficients
$50B^d$
$47B^d$
51^d_1
$W^{d*}_{1,n}$
$Z^d_{1,n}$
$W^{d*}_{k,n}$
$Z^d_{k,n}$
$\hat{s}^d_n$
52^d
51^d_k
$W^{d*}_{ML,n}$
$Z^d_{ML,n}$
51^d_{ML}

FIG. 12

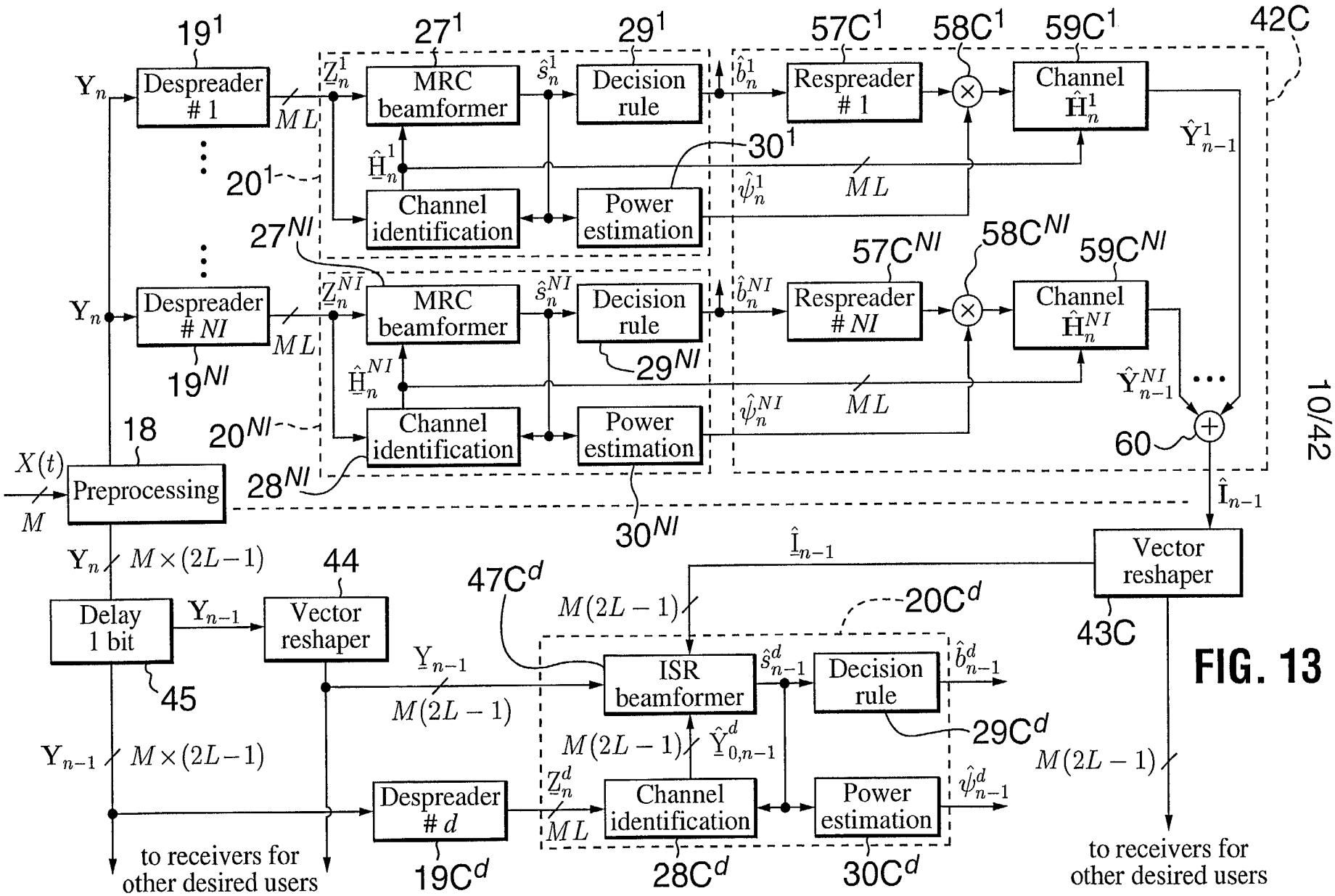

19^1
27^1
29^1
57C^1
58C^1
59C^1
42C
Despreader # 1
MRC beamformer
Decision rule
Respreader # 1
Channel Ĥ_n^1
Channel identification
Power estimation
20^1
30^1
27^NI
57C^NI
58C^NI
59C^NI
Despreader # NI
MRC beamformer
Decision rule
Respreader # NI
Channel Ĥ_n^NI
19^NI
29^NI
20^NI
Channel identification
Power estimation
18
X(t)
M
Preprocessing
28^NI
30^NI
60
Vector reshaper
43C
44
47C^d
20C^d
Delay 1 bit
45
Vector reshaper
ISR beamformer
Decision rule
29C^d
Despreader # d
Channel identification
Power estimation
19C^d
28C^d
30C^d
to receivers for other desired users
to receivers for other desired users
M×(2L−1)
M(2L−1)
ML

FIG. 13

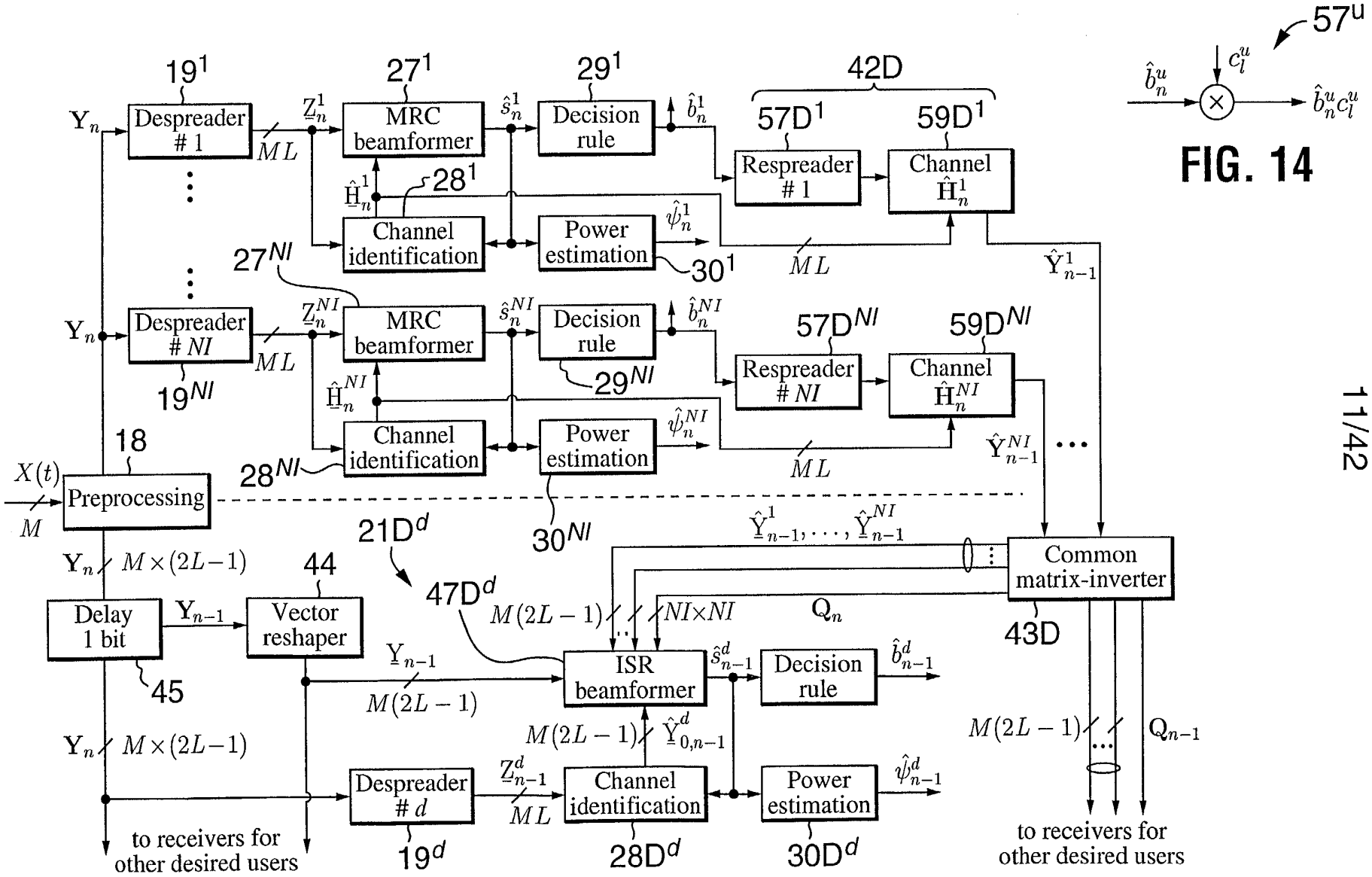
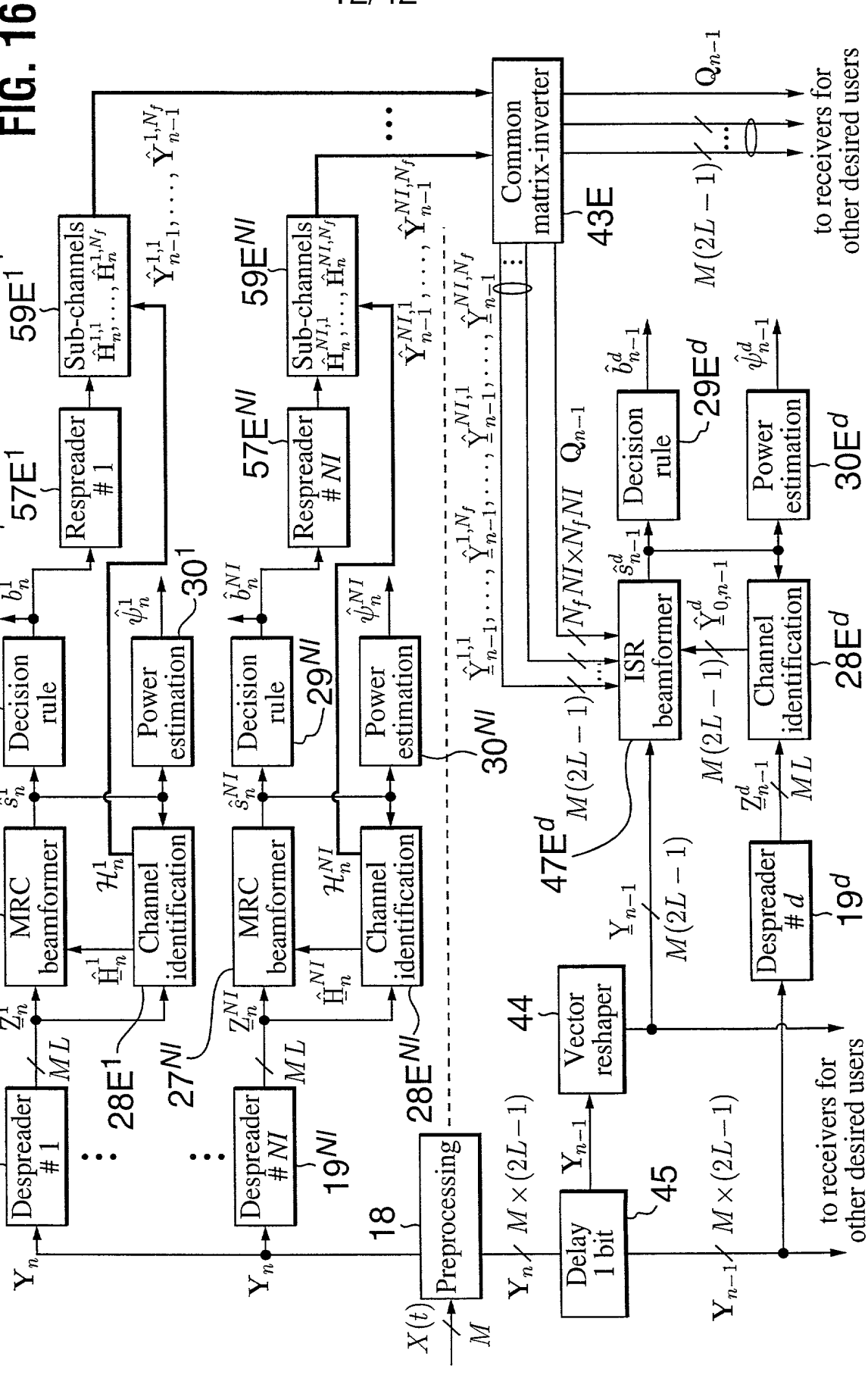

Despreader # 1
MRC beamformer
Decision rule
Respreader # 1
Channel identification
Power estimation
Despreader # NI
Respreader # NI
Preprocessing
Delay 1 bit
Vector reshaper
ISR beamformer
Common matrix-inverter
Despreader # d
to receivers for other desired users
to receivers for other desired users

FIG. 15

FIG. 14

FIG. 16


Preprocessing
18
Delay 1 bit
45
Vector reshaper
44
Despreader # 1
19^1
Despreader # NI
19^NI
Despreader # d
19^d
MRC beamformer
27^1
MRC beamformer
27^NI
ISR beamformer
47E^d
Channel identification
28E^1
Channel identification
28E^NI
Channel identification
28E^d
Decision rule
29^1
Decision rule
29^NI
Decision rule
29E^d
Power estimation
30^1
Power estimation
30^NI
Power estimation
30E^d
Respreader # 1
57E^1
Respreader # NI
57E^NI
42E
Sub-channels
59E^1
Sub-channels
59E^NI
Common matrix-inverter
43E
to receivers for other desired users
to receivers for other desired users

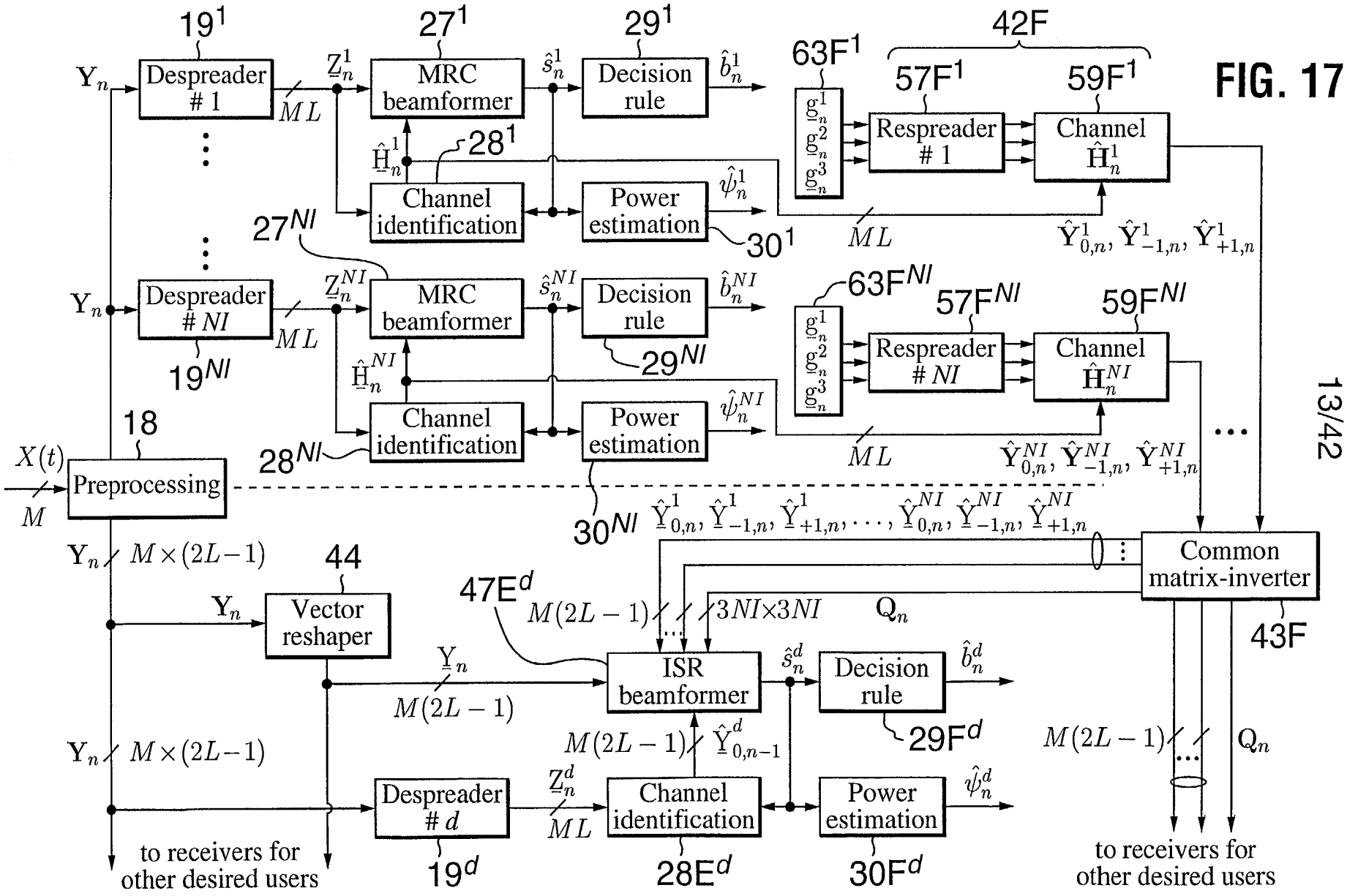


FIG. 17

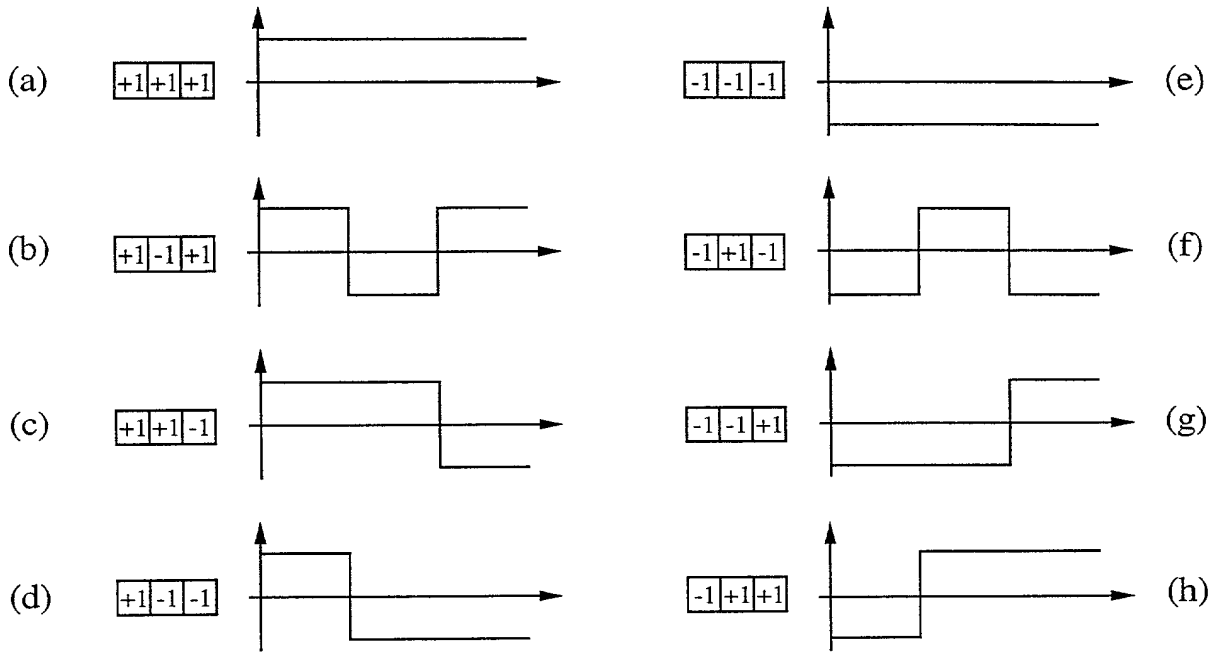

(a)
+1 +1 +1
(b)
+1 -1 +1
(c)
+1 +1 -1
(d)
+1 -1 -1
(e)
-1 -1 -1
(f)
-1 +1 -1
(g)
-1 -1 +1
(h)
-1 +1 +1

FIG. 18

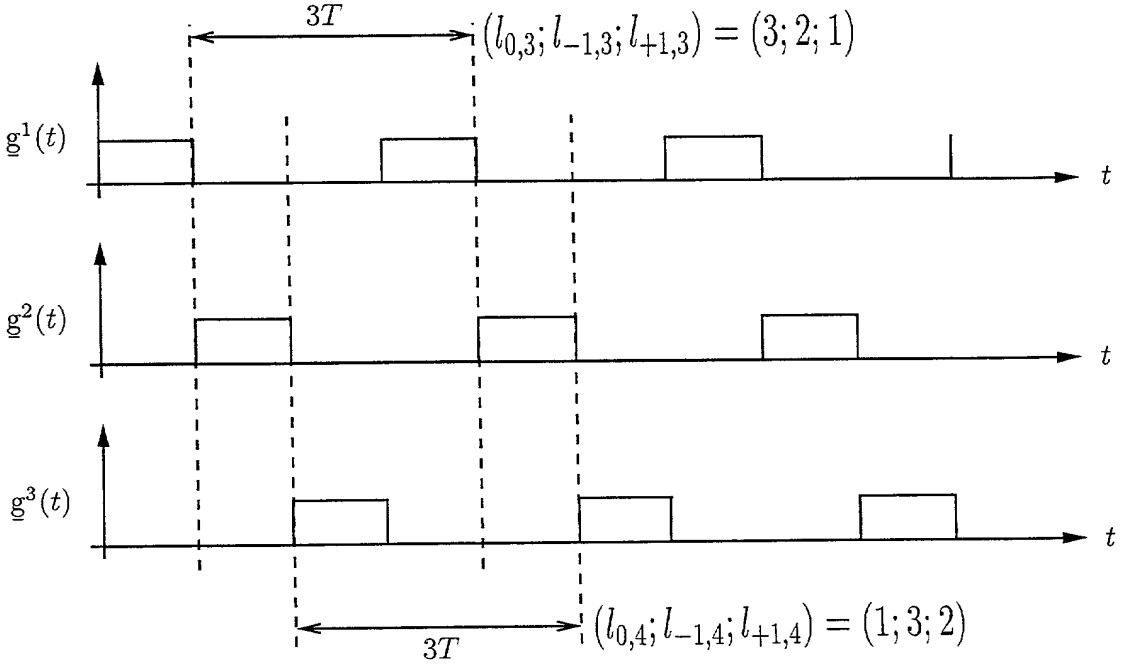
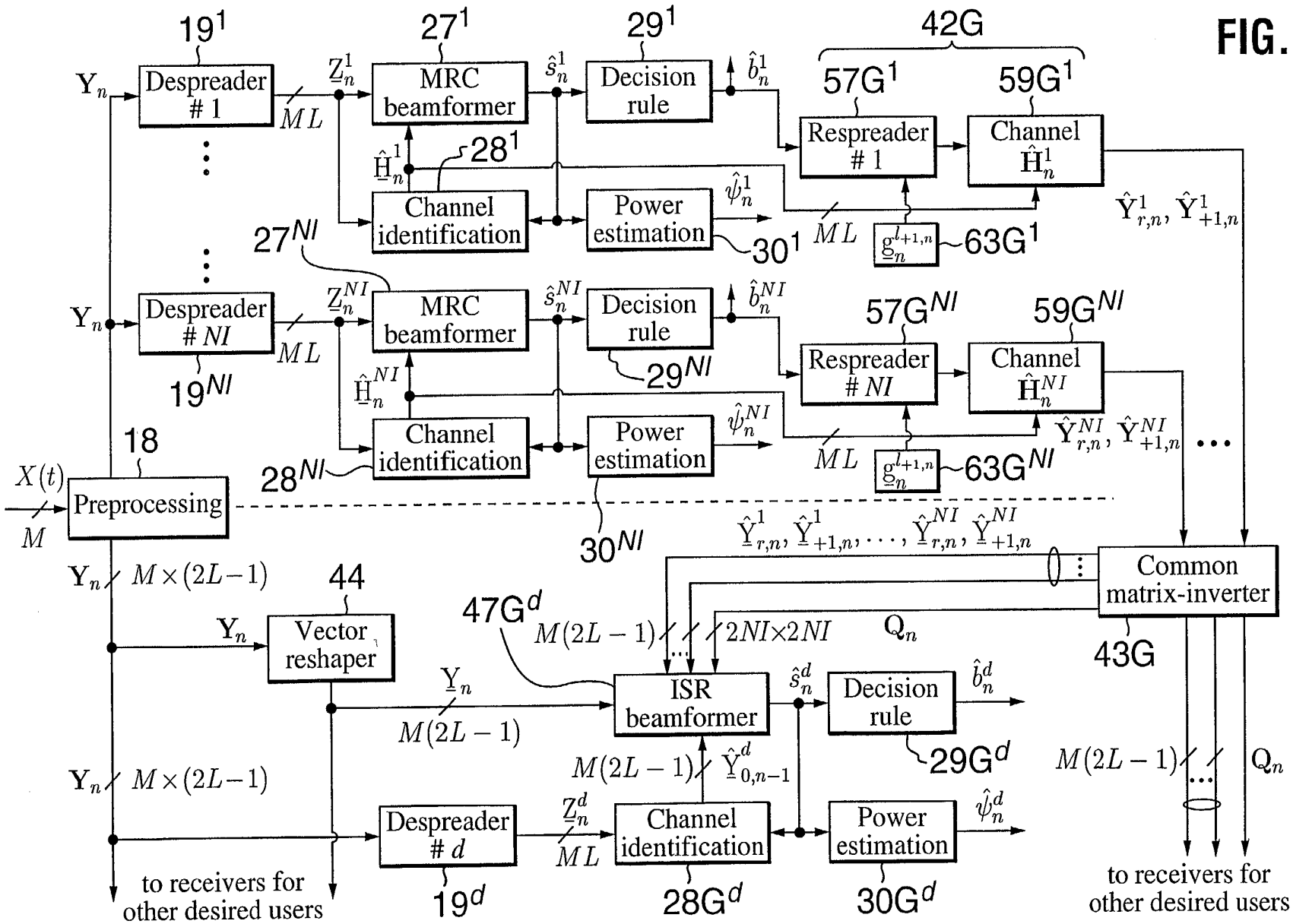

3T
$(l_{0,3}; l_{-1,3}; l_{+1,3}) = (3; 2; 1)$
$g^1(t)$
$g^2(t)$
$g^3(t)$
t
t
t
3T
$(l_{0,4}; l_{-1,4}; l_{+1,4}) = (1; 3; 2)$

FIG. 19

FIG. 20


19^1
27^1
29^1
42G
57G^1
59G^1
Despreader # 1
MRC beamformer
Decision rule
Respreader # 1
Channel Ĥ_n^1
Channel identification
Power estimation
28^1
30^1
63G^1
27^NI
Despreader # NI
19^NI
MRC beamformer
Decision rule
29^NI
57G^NI
59G^NI
Respreader # NI
Channel Ĥ_n^NI
Channel identification
Power estimation
28^NI
30^NI
63G^NI
18
Preprocessing
X(t)
M
ML
M×(2L−1)
44
Vector reshaper
47G^d
M(2L−1)
2NI×2NI
Q_n
Common matrix-inverter
43G
ISR beamformer
Decision rule
29G^d
Despreader # d
19^d
Channel identification
28G^d
Power estimation
30G^d
to receivers for other desired users
to receivers for other desired users

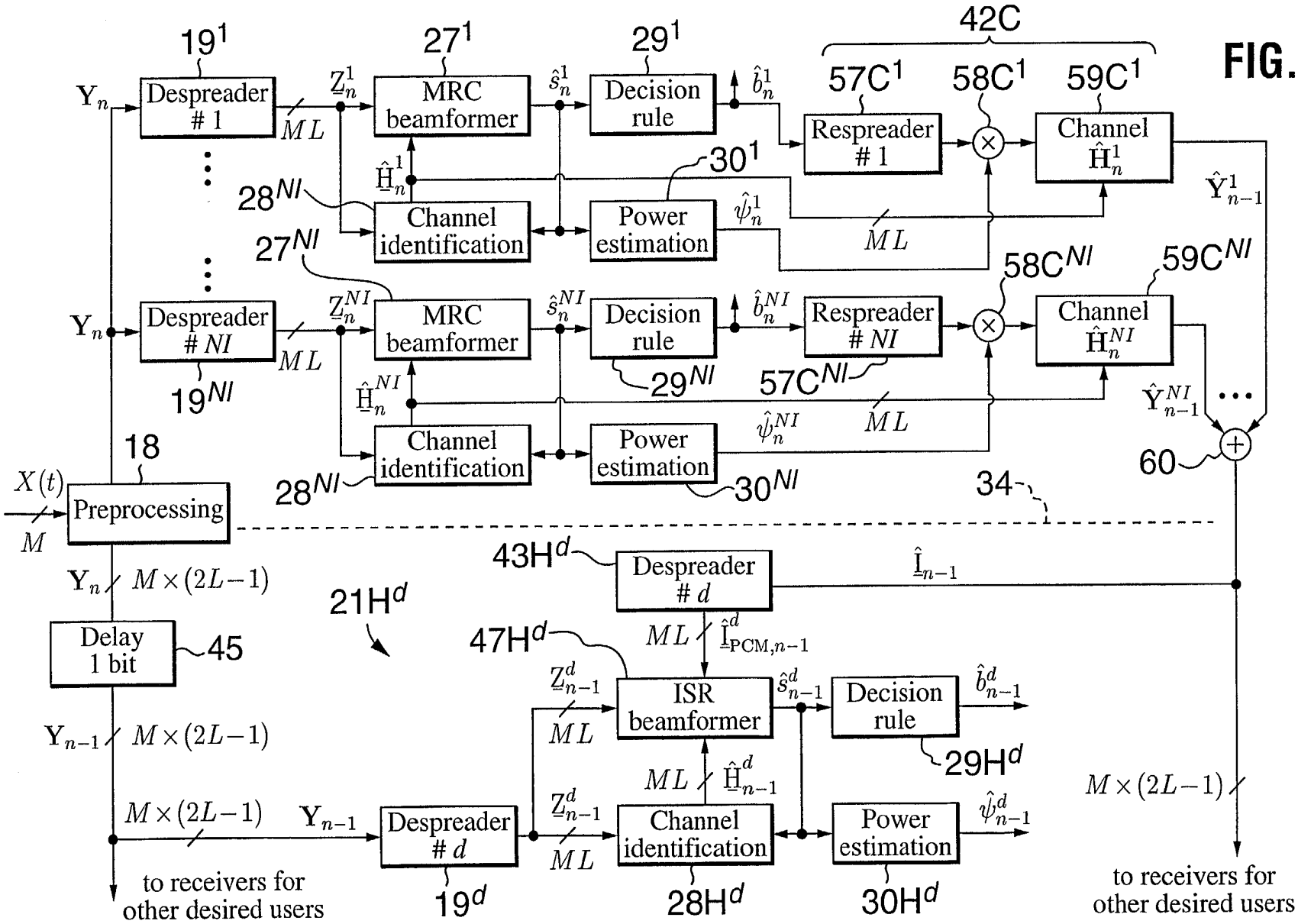
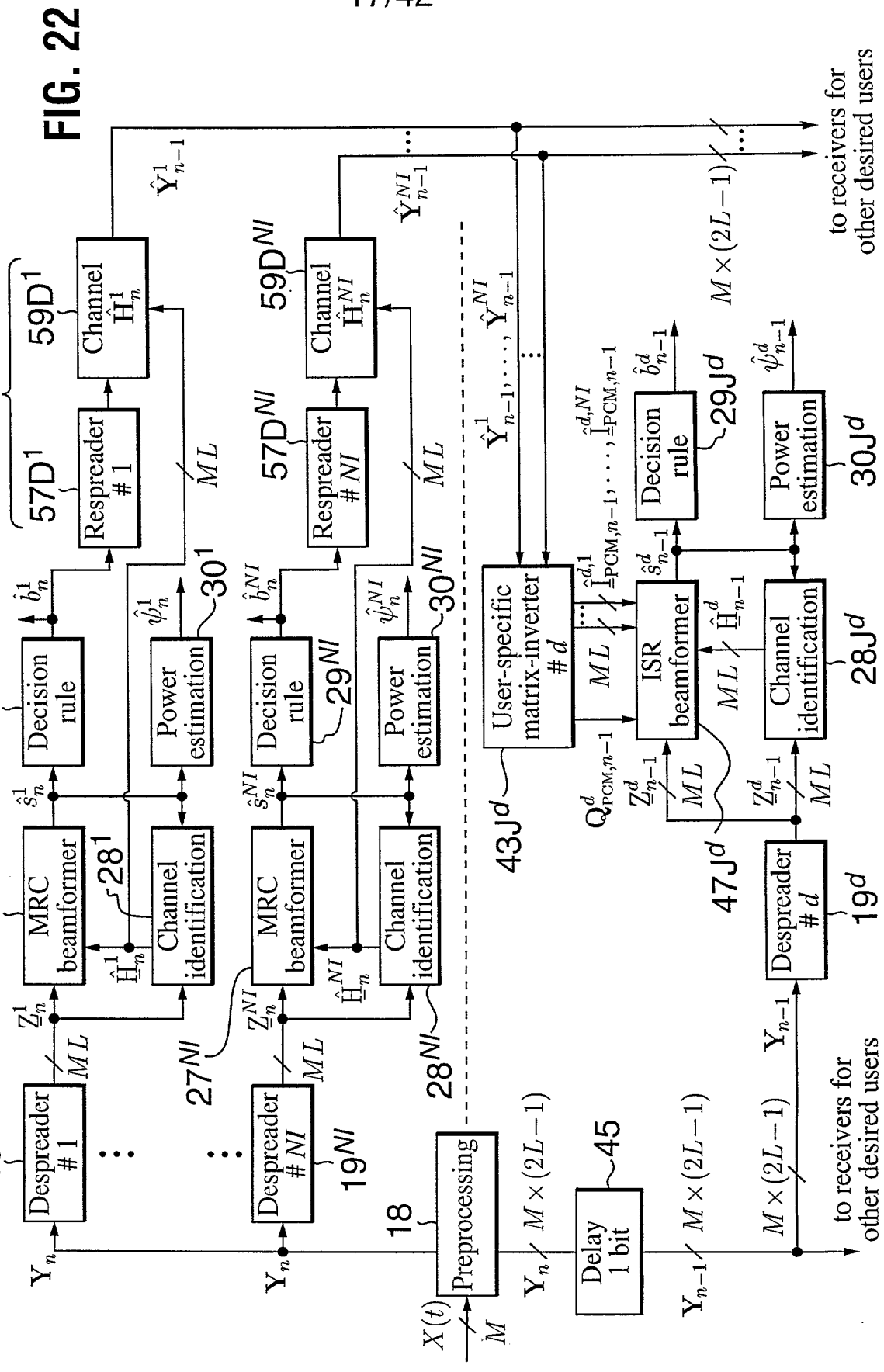


FIG. 21

FIG. 22


Despreader # 1
Despreader # NI
Preprocessing
Delay 1 bit
MRC beamformer
Channel identification
Decision rule
Power estimation
Respreader # 1
Respreader # NI
Channel
User-specific matrix-inverter # d
ISR beamformer
Despreader # d
to receivers for other desired users
42D
43J^d
45
47J^d

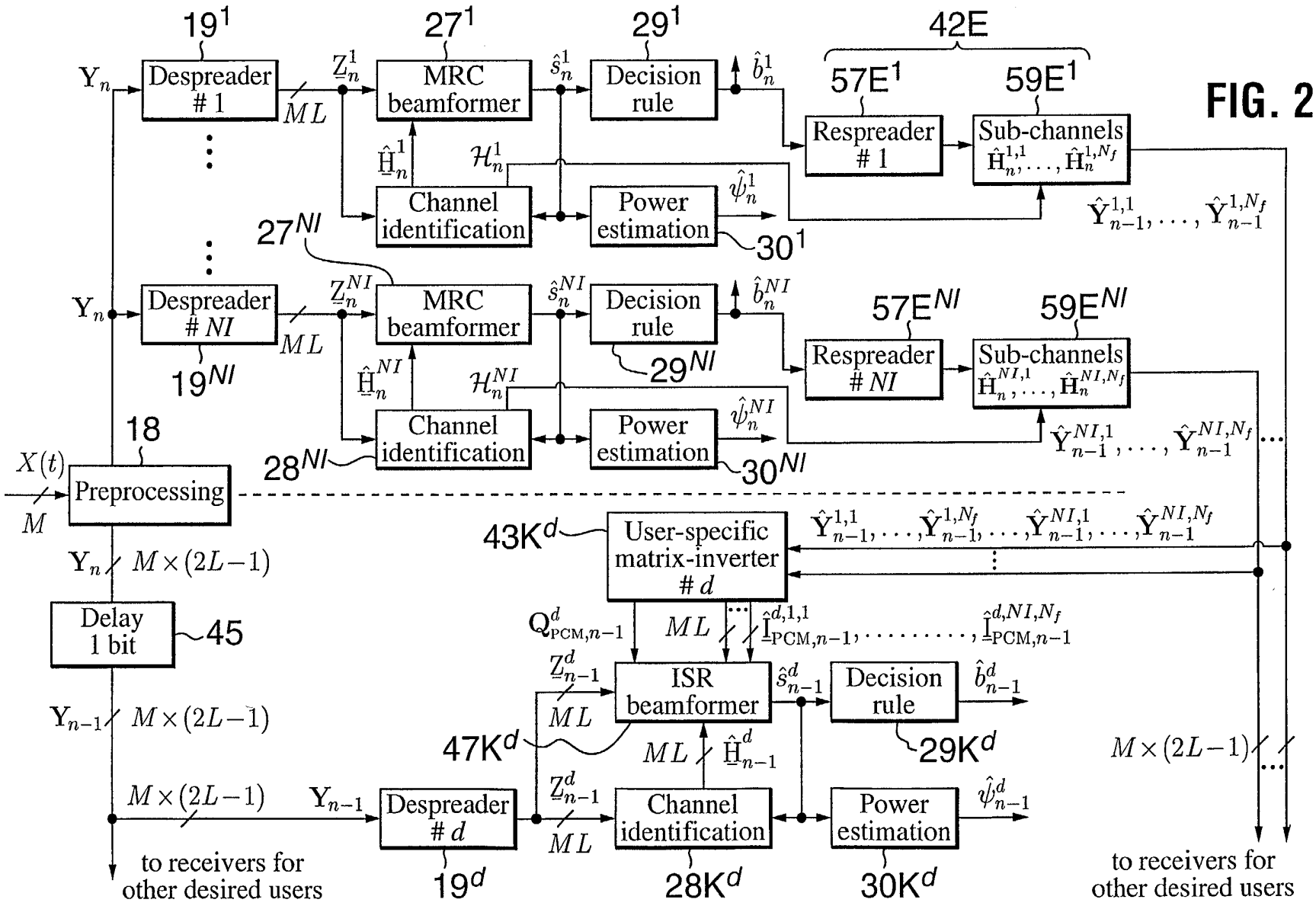

19^1
27^1
29^1
42E
57E^1
59E^1
Despreader # 1
MRC beamformer
Decision rule
Respreader # 1
Sub-channels
Channel identification
Power estimation
30^1
27^NI
Despreader # NI
19^NI
MRC beamformer
Decision rule
29^NI
57E^NI
59E^NI
Respreader # NI
Sub-channels
Channel identification
Power estimation
30^NI
28^NI
18
Preprocessing
X(t)
M
ML
M×(2L−1)
Delay 1 bit
45
43K^d
User-specific matrix-inverter # d
ISR beamformer
47K^d
Decision rule
29K^d
Despreader # d
19^d
Channel identification
28K^d
Power estimation
30K^d
to receivers for other desired users
to receivers for other desired users

FIG. 23

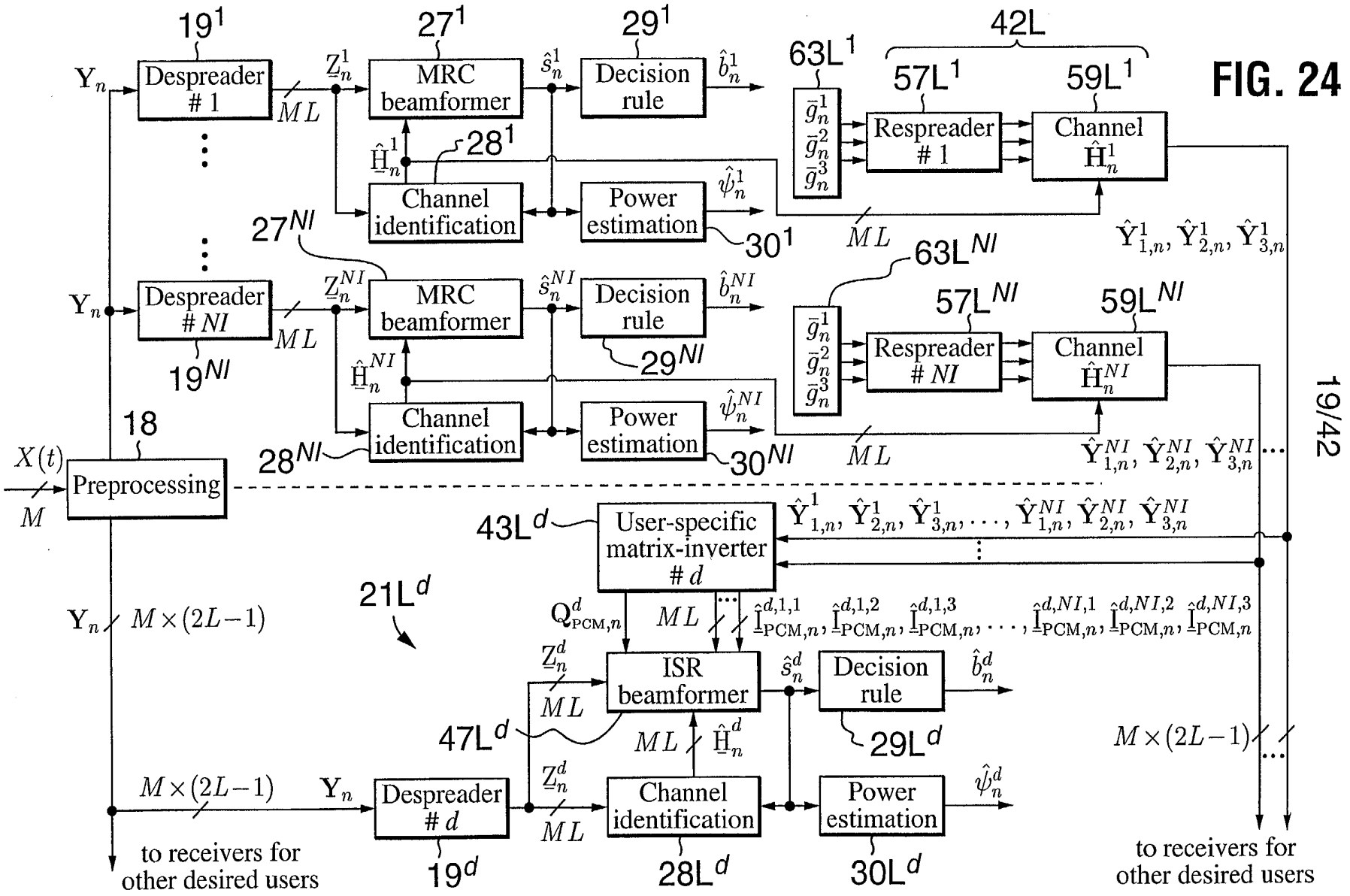

19^1
27^1
29^1
42L
63L^1
57L^1
59L^1
Y_n
Despreader # 1
ML
Z^1_n
MRC beamformer
ŝ^1_n
Decision rule
b̂^1_n
Ĥ^1_n
28^1
Channel identification
Power estimation
ψ̂^1_n
30^1
g^1_n g^2_n g^3_n
Respreader # 1
Channel Ĥ^1_n
Ŷ^1_{1,n}, Ŷ^1_{2,n}, Ŷ^1_{3,n}
27^NI
63L^NI
57L^NI
59L^NI
Despreader # NI
19^NI
Z^NI_n
MRC beamformer
ŝ^NI_n
Decision rule
b̂^NI_n
29^NI
Ĥ^NI_n
Channel identification
Power estimation
ψ̂^NI_n
28^NI
30^NI
Respreader # NI
Channel Ĥ^NI_n
Ŷ^NI_{1,n}, Ŷ^NI_{2,n}, Ŷ^NI_{3,n}
18
X(t)
M
Preprocessing
43L^d
User-specific matrix-inverter # d
Ŷ^1_{1,n}, Ŷ^1_{2,n}, Ŷ^1_{3,n}, ..., Ŷ^NI_{1,n}, Ŷ^NI_{2,n}, Ŷ^NI_{3,n}
21L^d
Y_n
M×(2L−1)
Q^d_{PCM,n}
Î^{d,1,1}_{PCM,n}, Î^{d,1,2}_{PCM,n}, Î^{d,1,3}_{PCM,n}, ..., Î^{d,NI,1}_{PCM,n}, Î^{d,NI,2}_{PCM,n}, Î^{d,NI,3}_{PCM,n}
Z^d_n
ISR beamformer
ŝ^d_n
Decision rule
b̂^d_n
47L^d
Ĥ^d_n
29L^d
Despreader # d
Channel identification
Power estimation
ψ̂^d_n
19^d
28L^d
30L^d
to receivers for other desired users
to receivers for other desired users

FIG. 24

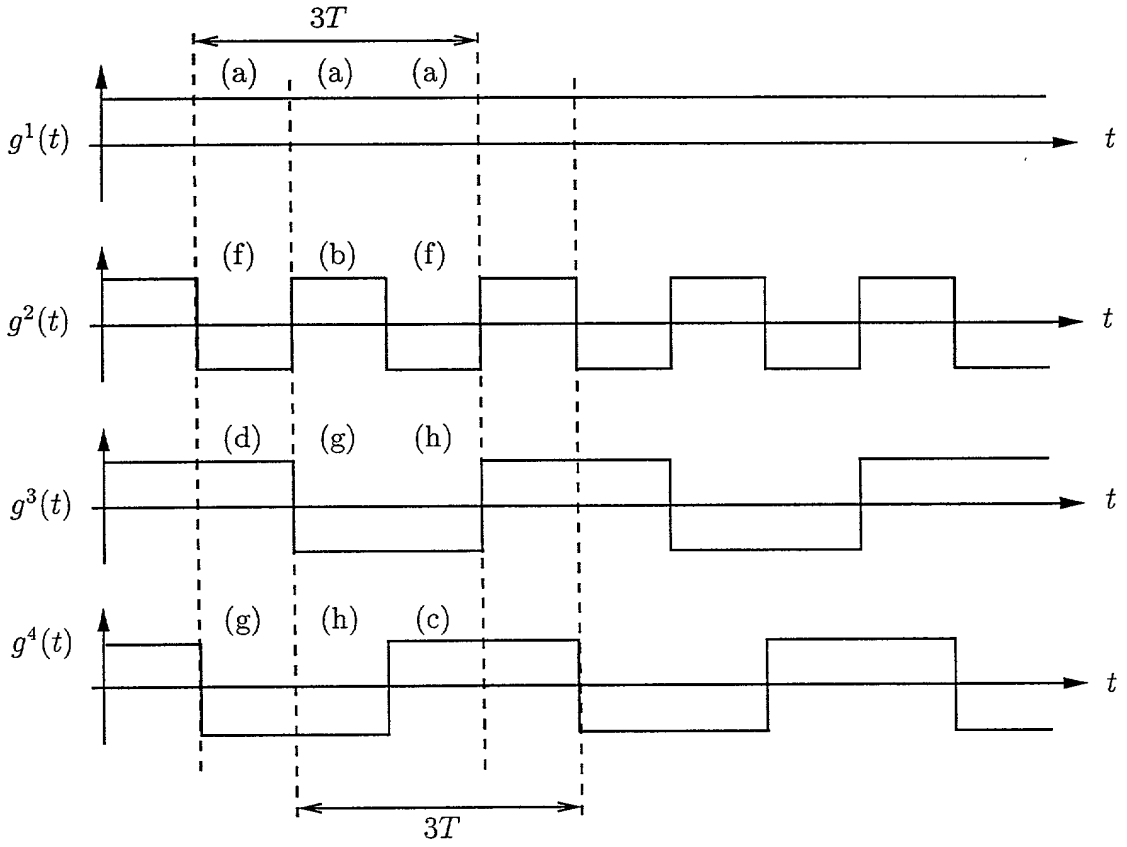


FIG. 25

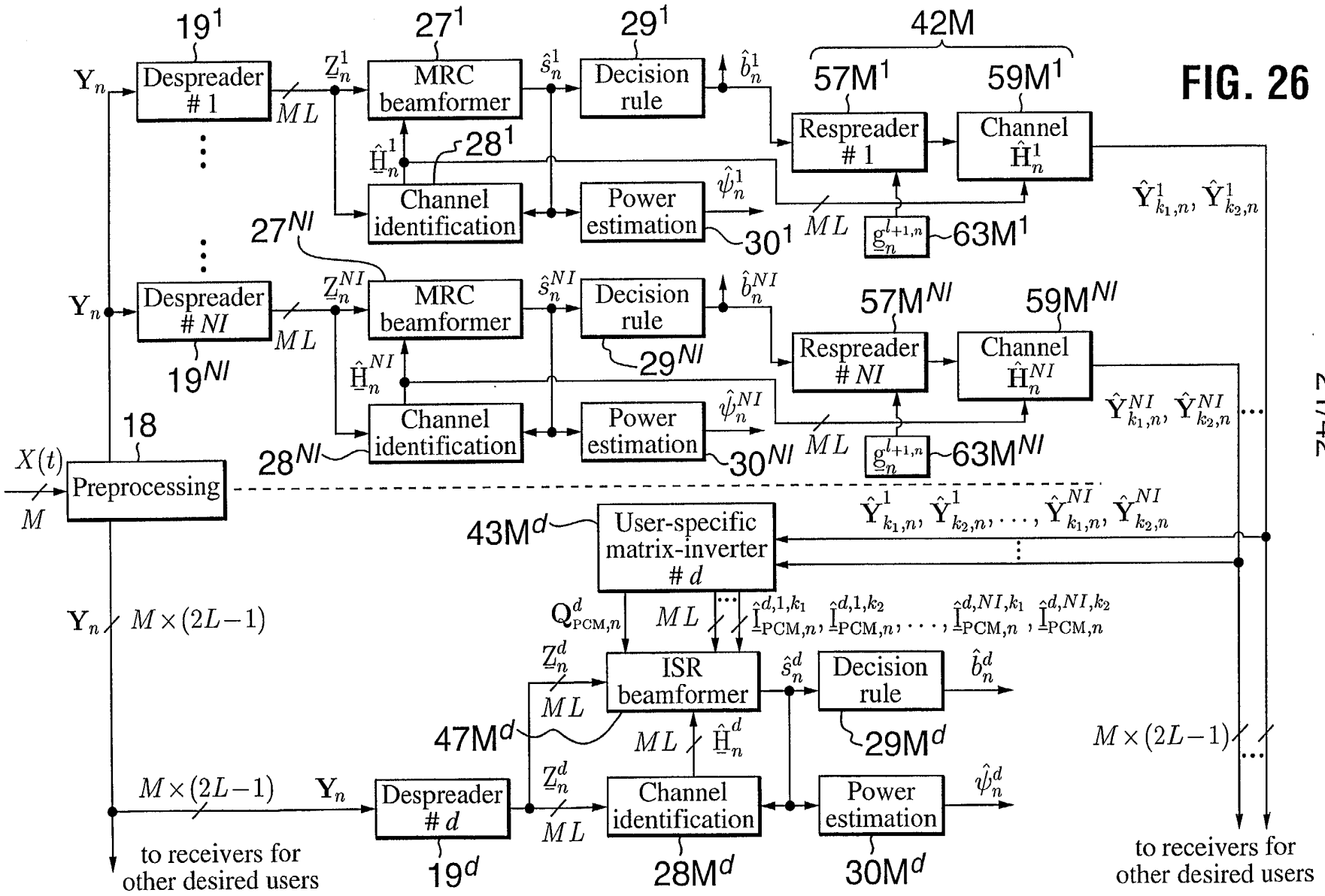

19^1
27^1
29^1
42M
57M^1
59M^1
Despreader # 1
MRC beamformer
Decision rule
Respreader # 1
Channel Ĥ_n^1
Channel identification
Power estimation
28^1
30^1
63M^1
27^NI
Despreader # NI
19^NI
MRC beamformer
Decision rule
29^NI
57M^NI
59M^NI
Respreader # NI
Channel Ĥ_n^NI
Channel identification
Power estimation
28^NI
30^NI
63M^NI
18
Preprocessing
X(t)
M
43M^d
User-specific matrix-inverter # d
ISR beamformer
Decision rule
29M^d
47M^d
Despreader # d
Channel identification
Power estimation
19^d
28M^d
30M^d
M×(2L−1)
ML
to receivers for other desired users
to receivers for other desired users

FIG. 26

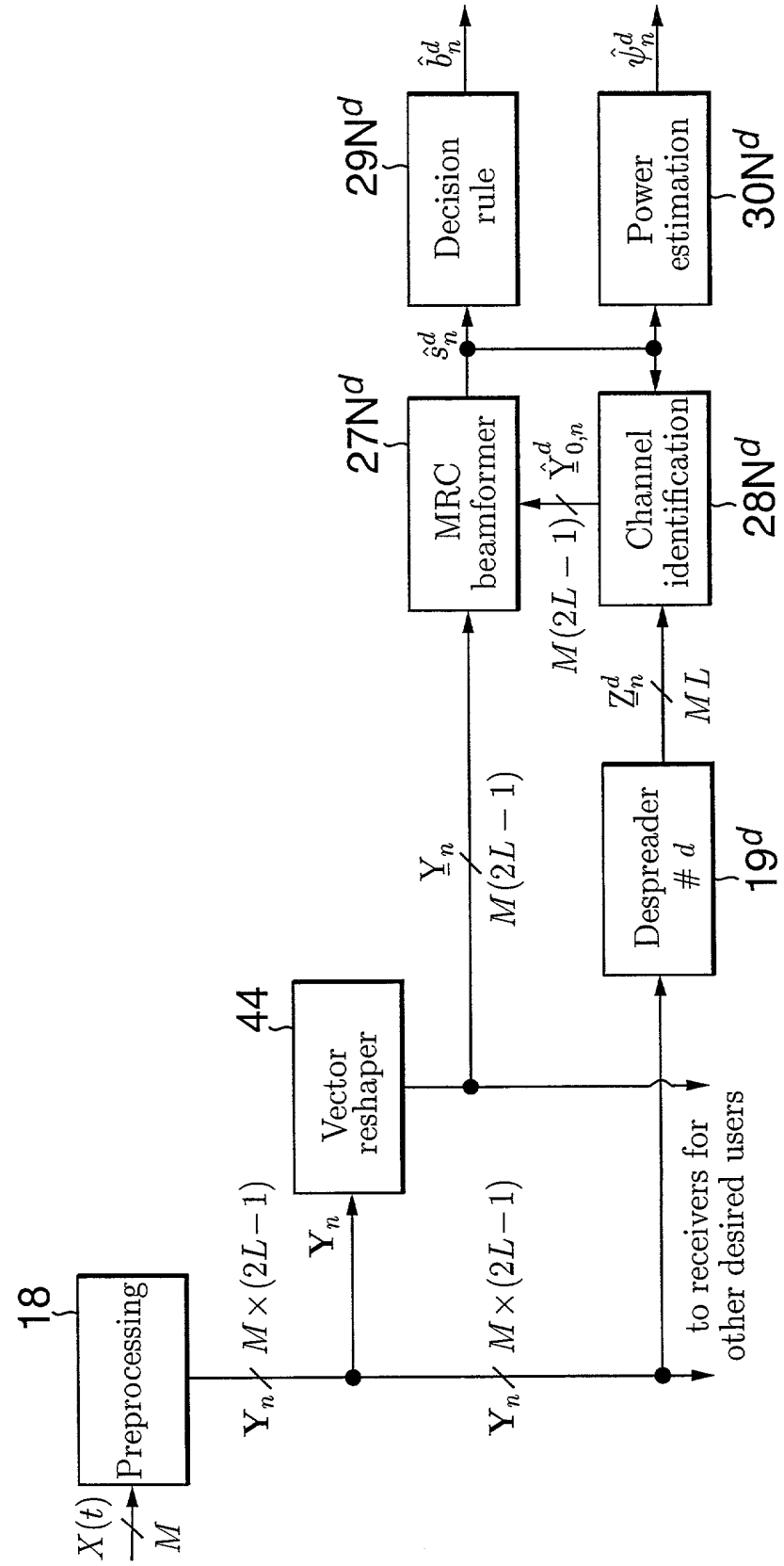
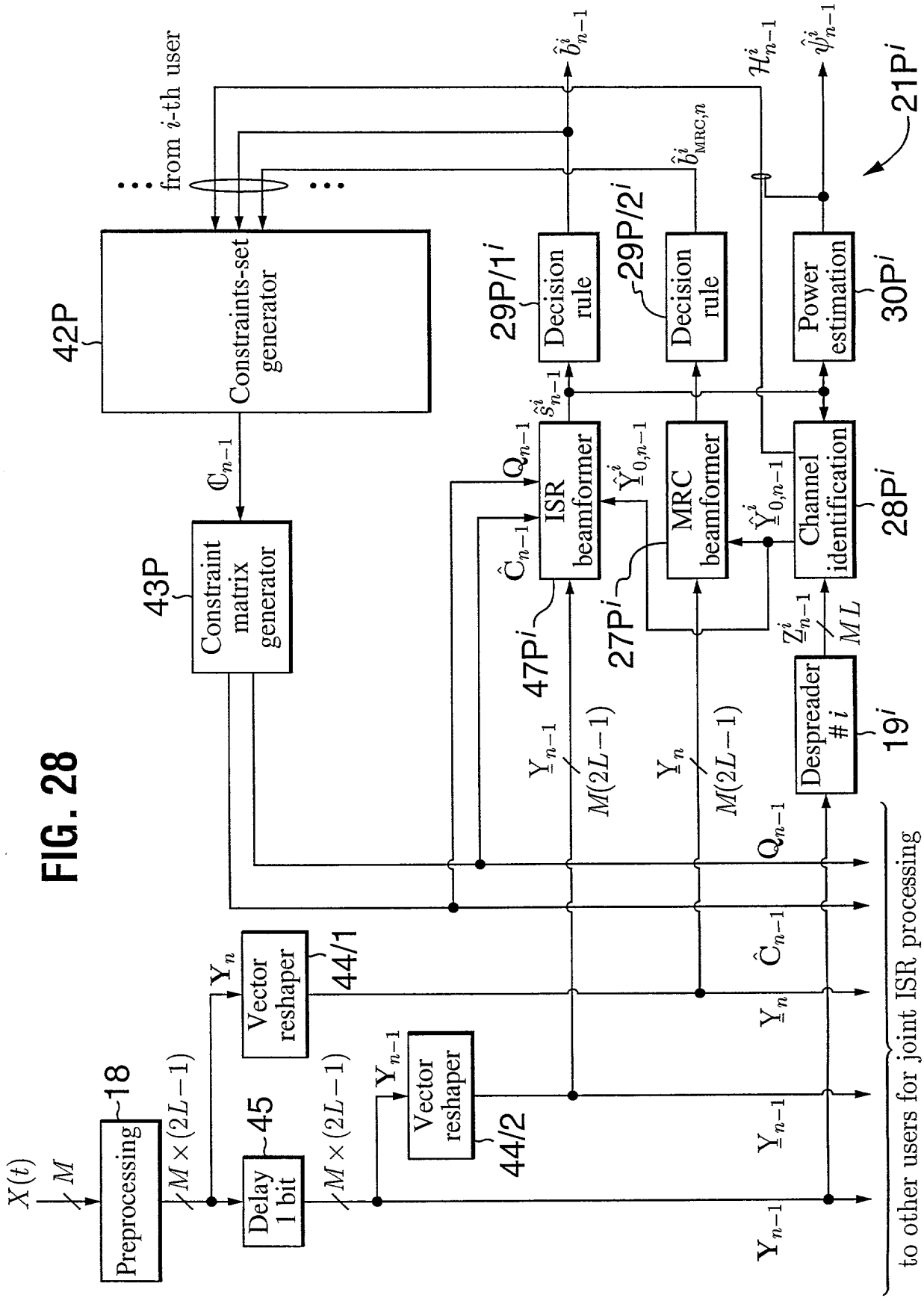

$X(t)$
M
18
Preprocessing
$\mathbf{Y}_n$
$M \times (2L-1)$
$\mathbf{Y}_n$
$M \times (2L-1)$
44
Vector reshaper
$\underline{Y}_n$
$M(2L-1)$
27N^d
MRC beamformer
$\hat{s}_n^d$
29N^d
Decision rule
$\hat{b}_n^d$
$M(2L-1)$
$\hat{\underline{Y}}_{0,n}^d$
28N^d
Channel identification
$\underline{Z}_n^d$
ML
19^d
Despreader # d
30N^d
Power estimation
$\hat{\psi}_n^d$
to receivers for other desired users

FIG. 27

FIG. 28


X(t)
M
Preprocessing
18
M × (2L−1)
Delay 1 bit
45
M × (2L−1)
Y_n
Vector reshaper
44/1
Y_{n−1}
Vector reshaper
44/2
Y_{n−1}
Y_n
Ĉ_{n−1}
Q_{n−1}
Y_{n−1}
M(2L−1)
Y_n
M(2L−1)
Q_{n−1}
Z^i_{n−1}
ML
Despreader # i
19^i
Y_{n−1}
to other users for joint ISR processing
from i-th user
42P
Constraints-set generator
43P
Constraint matrix generator
Ĉ_{n−1}
47P^i
Ĉ_{n−1}
Q_{n−1}
ISR beamformer
ŝ^i_{n−1}
29P/1^i
Decision rule
b̂^i_{n−1}
27P^i
Ŷ^i_{0,n−1}
MRC beamformer
29P/2^i
Decision rule
î^i_{MRC,n}
Ŷ^i_{0,n−1}
Channel identification
28P^i
Power estimation
30P^i
Ĥ^i_{n−1}
ψ̂^i_{n−1}
21P^i

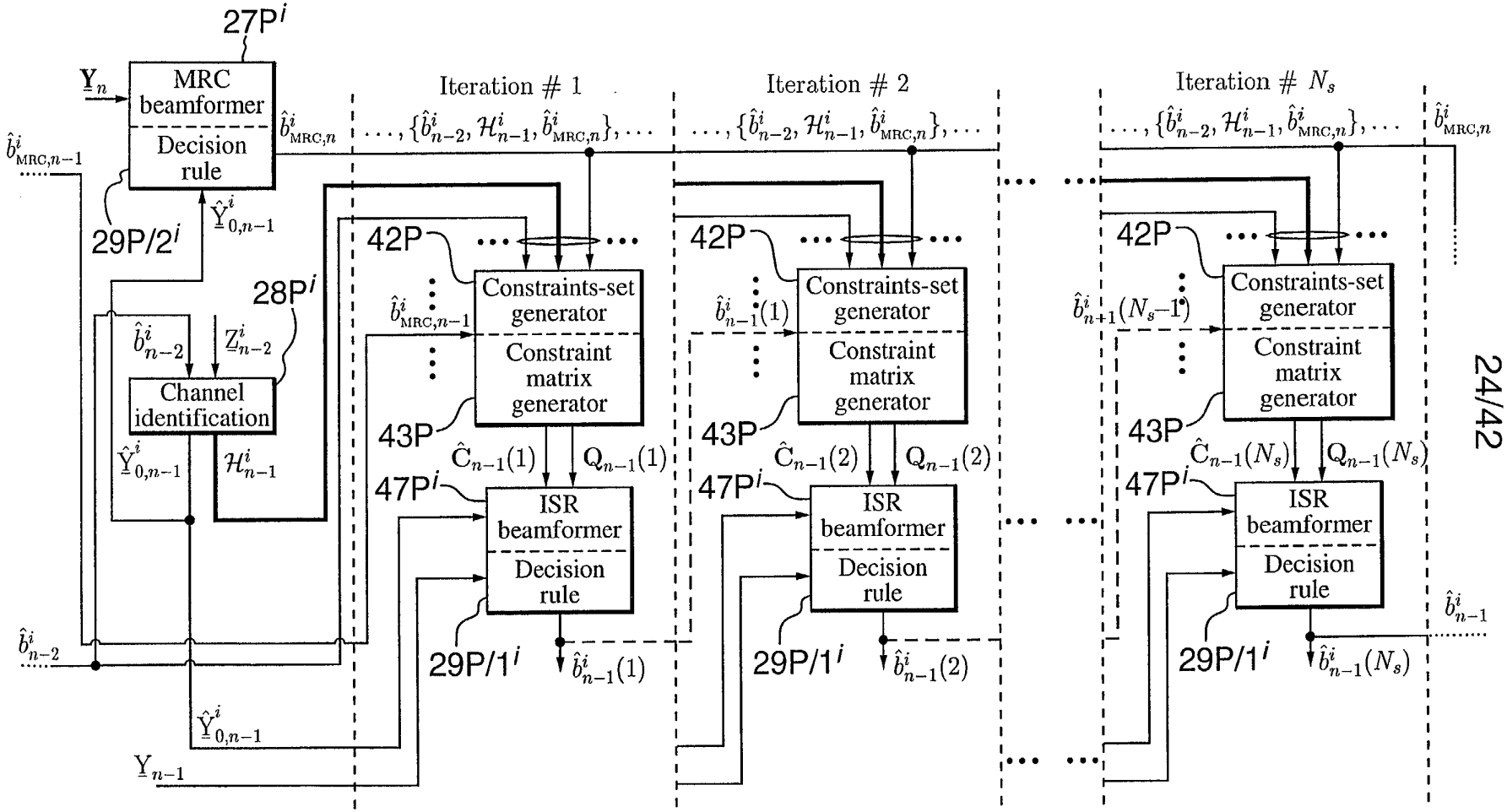

27P^i
MRC beamformer
Decision rule
29P/2^i
28P^i
Channel identification
Iteration # 1
Iteration # 2
Iteration # N_s
42P
Constraints-set generator
Constraint matrix generator
43P
47P^i
ISR beamformer
Decision rule
29P/1^i
24/42

FIG. 29

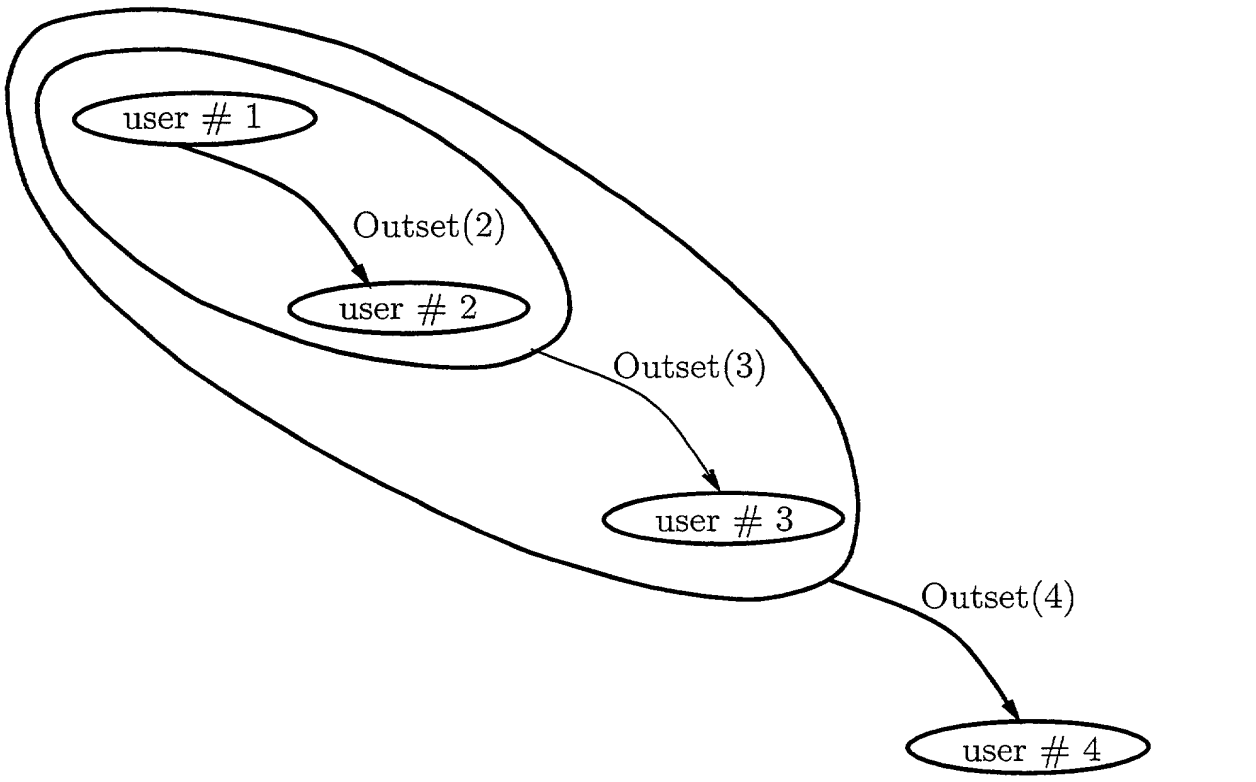


FIG. 30

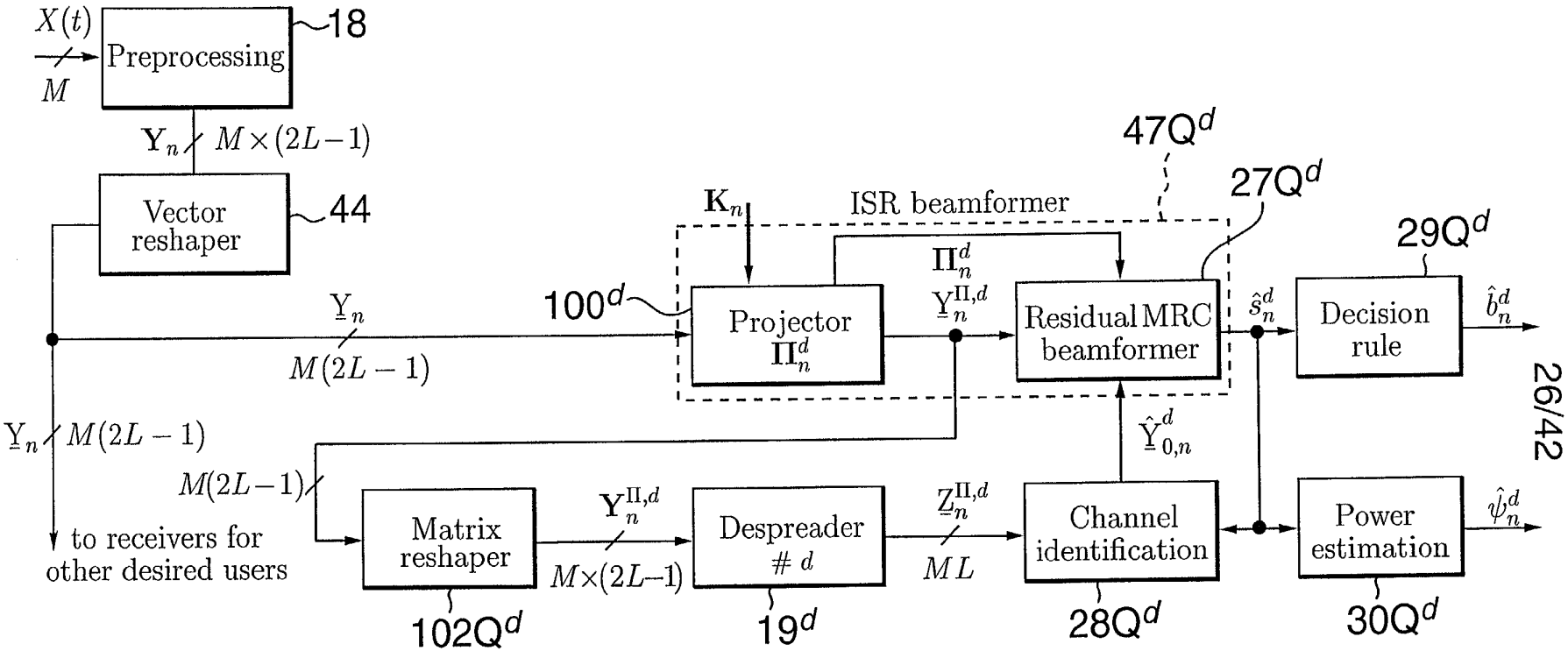

X(t)
M
Preprocessing
18
Y_n
M×(2L−1)
Vector reshaper
44
47Q^d
27Q^d
K_n
ISR beamformer
Π_n^d
29Q^d
100^d
Y_n
M(2L−1)
Projector Π_n^d
Y_n^{II,d}
Residual MRC beamformer
ŝ_n^d
Decision rule
b̂_n^d
Y_n
M(2L−1)
Ŷ_{0,n}^d
M(2L−1)
to receivers for other desired users
Matrix reshaper
Y_n^{II,d}
M×(2L−1)
Despreader # d
Z_n^{II,d}
ML
Channel identification
Power estimation
ψ̂_n^d
102Q^d
19^d
28Q^d
30Q^d
26/42

FIG. 31

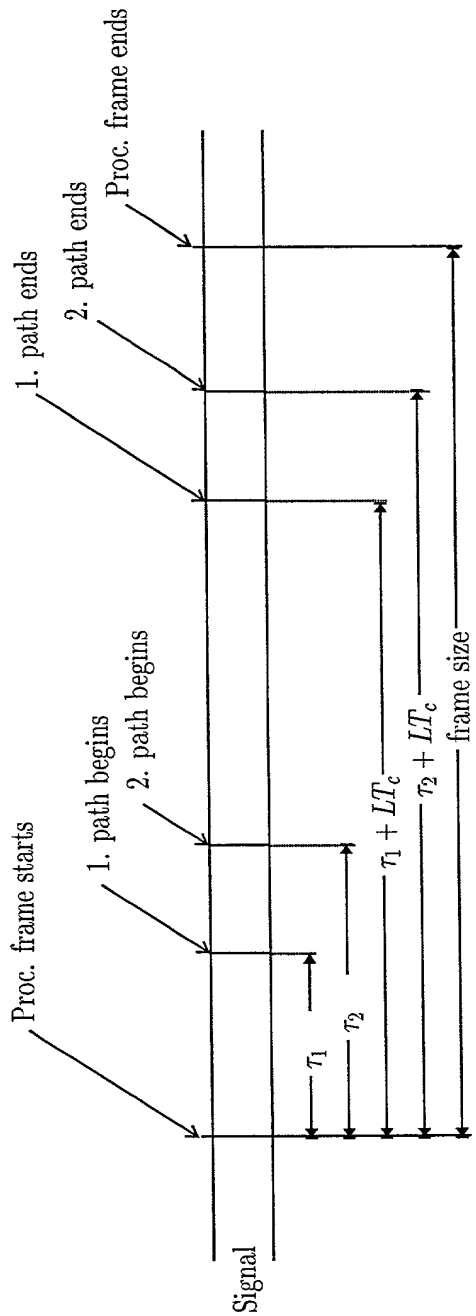

Proc. frame starts
1. path begins
2. path begins
1. path ends
2. path ends
Proc. frame ends
τ_1
τ_2
$\tau_1 + LT_c$
$\tau_2 + LT_c$
frame size
Signal

FIG. 32

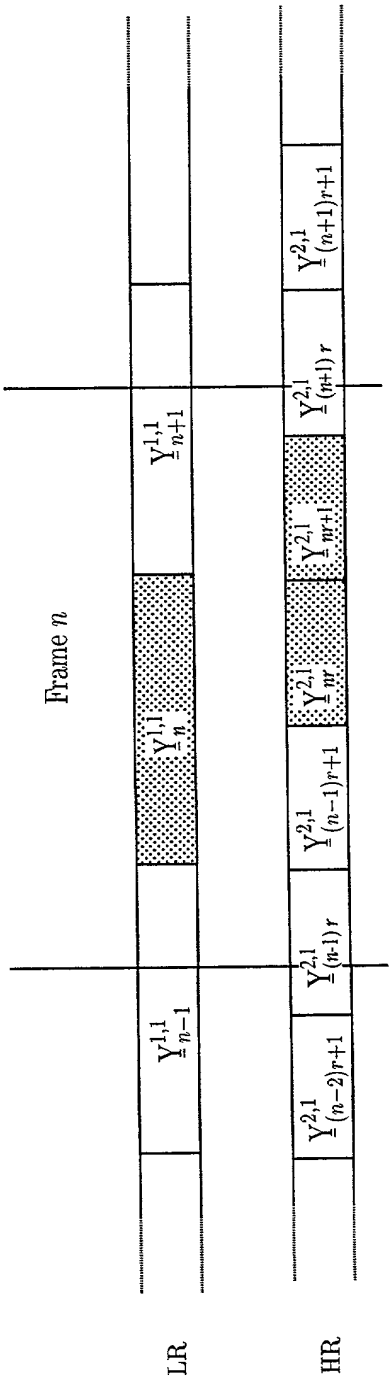

Frame n
$Y^{1,1}_{n-1}$
$Y^{1,1}_{n}$
$Y^{1,1}_{n+1}$
$Y^{2,1}_{(n-2)r+1}$
$Y^{2,1}_{(n-1)r}$
$Y^{2,1}_{(n-1)r+1}$
$Y^{2,1}_{nr}$
$Y^{2,1}_{nr+1}$
$Y^{2,1}_{(n+1)r}$
$Y^{2,1}_{(n+1)r+1}$
LR
HR

FIG. 33

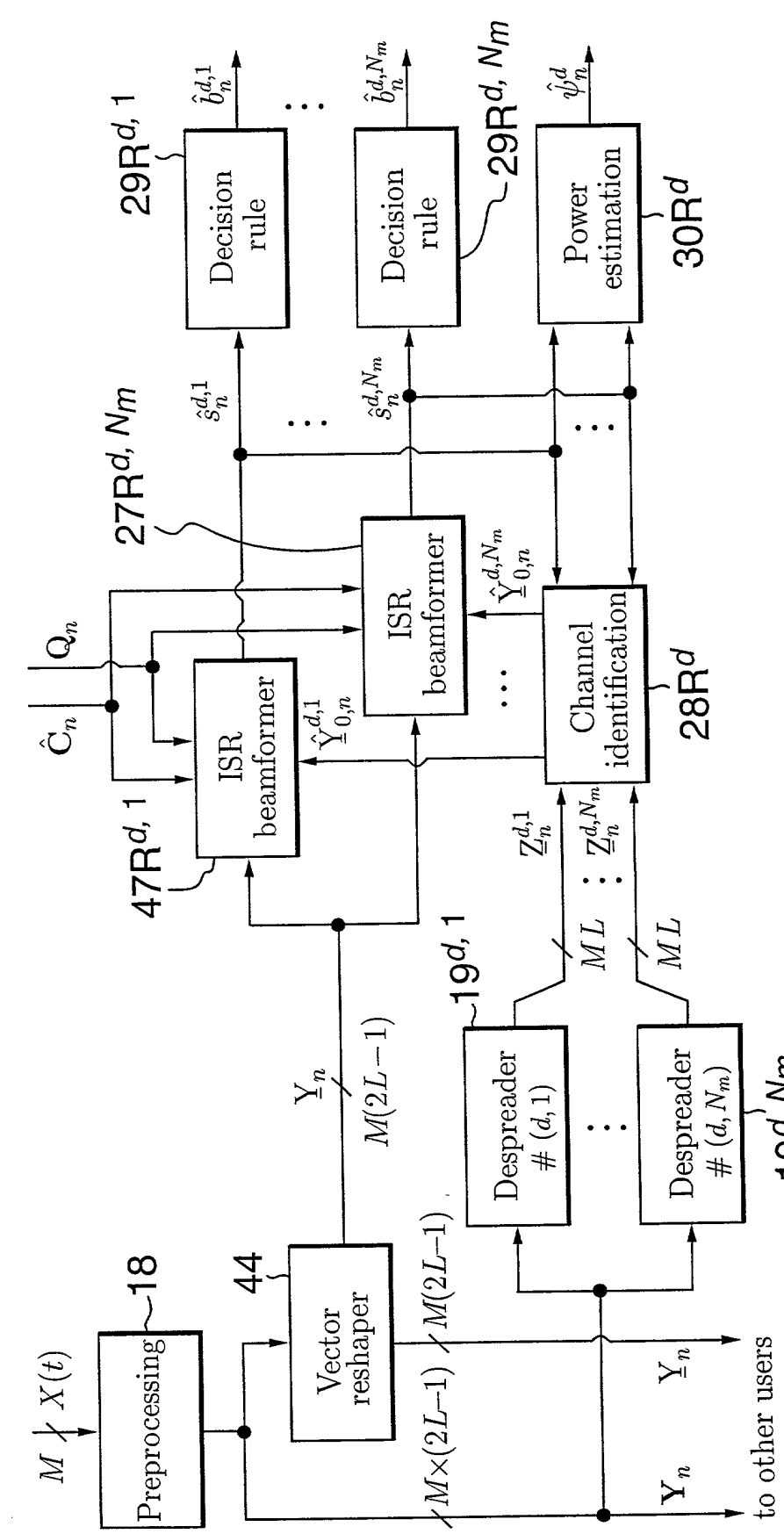

Preprocessing
18
Vector reshaper
44
Despreader # (d, 1)
19d, 1
Despreader # (d, Nm)
19d, Nm
ISR beamformer
47Rd, 1
ISR beamformer
27Rd, Nm
Channel identification
28Rd
Decision rule
29Rd, 1
Decision rule
29Rd, Nm
Power estimation
30Rd
M × (2L−1)
M(2L−1)
ML
to other users

FIG. 34

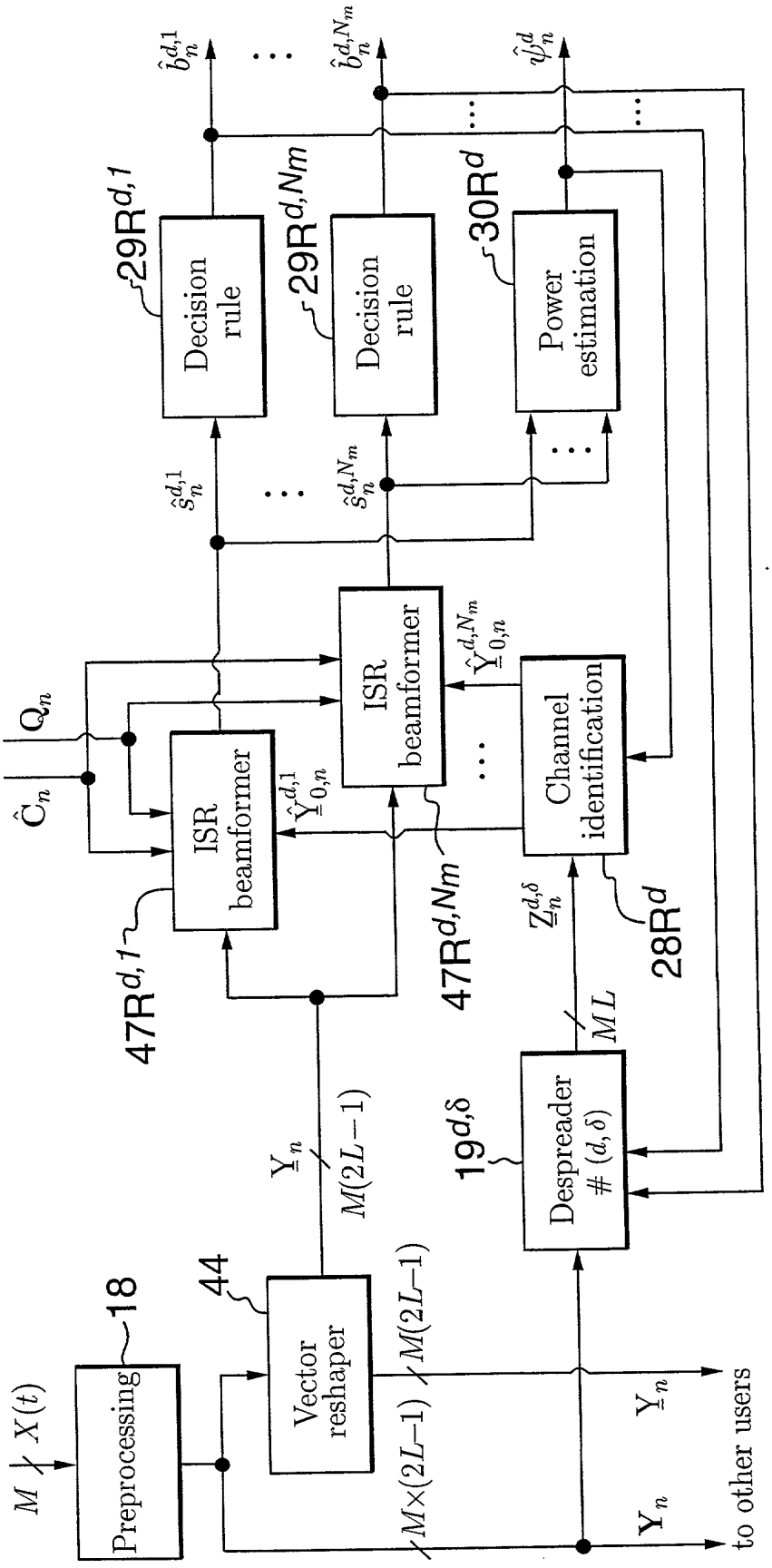

M X(t)
Preprocessing
18
44
Vector reshaper
M×(2L−1)
M(2L−1)
Y_n
Y_n
to other users
Despreader # (d, δ)
19^{d,δ}
Z_n^{d,δ}
ML
Channel identification
28R^d
ISR beamformer
47R^{d,1}
ISR beamformer
47R^{d,Nm}
Ĉ_n
Q_n
Decision rule
29R^{d,1}
Decision rule
29R^{d,Nm}
Power estimation
30R^d
ŝ_n^{d,1}
ŝ_n^{d,Nm}
b̂_n^{d,1}
b̂_n^{d,Nm}
ψ̂_n^d

FIG. 35

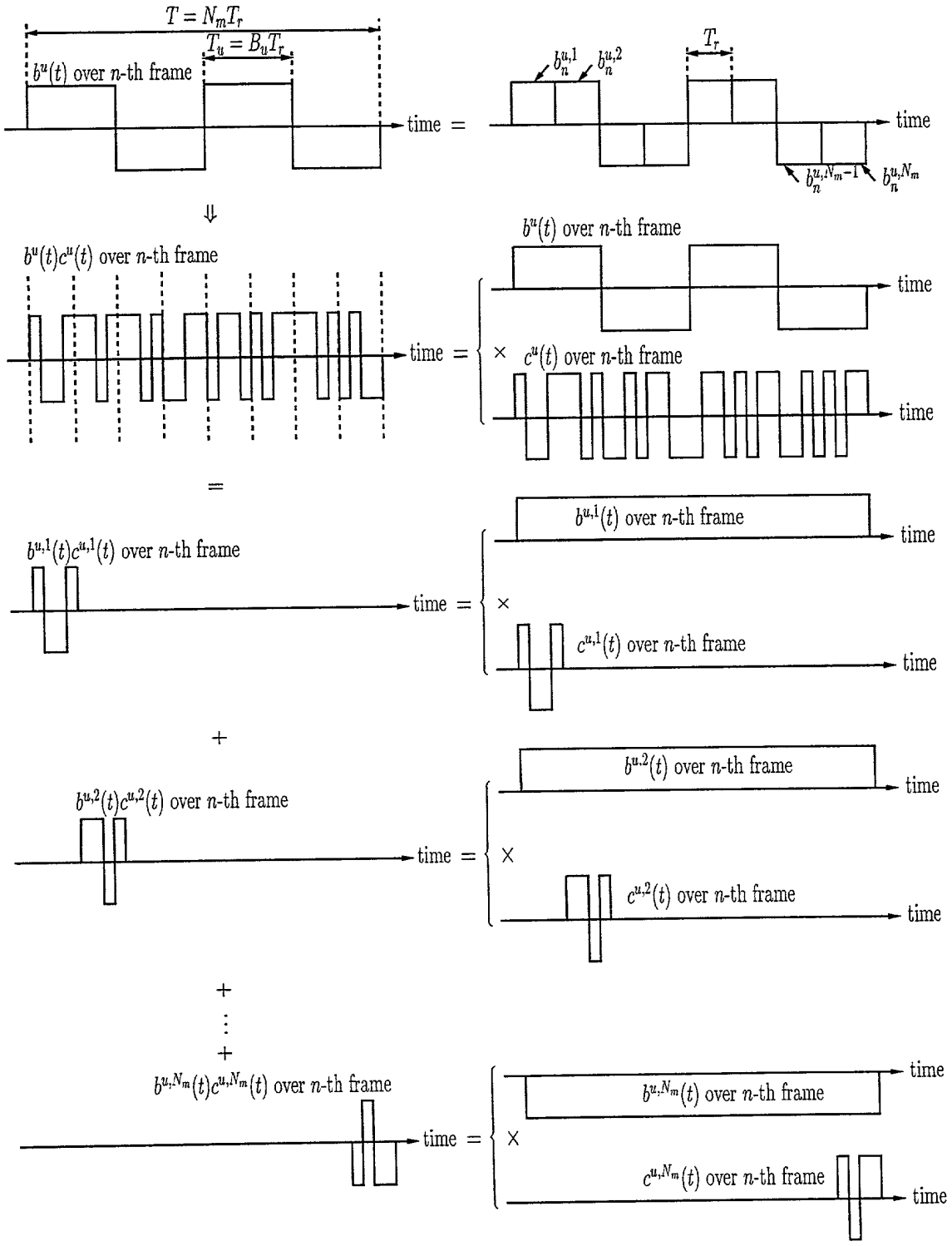

$T = N_m T_r$
$T_u = B_u T_r$
$b^u(t)$ over n-th frame
time =
$b_n^{u,1}$ $b_n^{u,2}$
T_r
time
b_n^{u,N_m-1} b_n^{u,N_m}
$b^u(t)c^u(t)$ over n-th frame
time =
$b^u(t)$ over n-th frame
time
×
$c^u(t)$ over n-th frame
time
=
$b^{u,1}(t)c^{u,1}(t)$ over n-th frame
time =
$b^{u,1}(t)$ over n-th frame
time
×
$c^{u,1}(t)$ over n-th frame
time
+
$b^{u,2}(t)c^{u,2}(t)$ over n-th frame
time =
$b^{u,2}(t)$ over n-th frame
time
×
$c^{u,2}(t)$ over n-th frame
time
+
⋮
+
$b^{u,N_m}(t)c^{u,N_m}(t)$ over n-th frame
time =
time
$b^{u,N_m}(t)$ over n-th frame
×
$c^{u,N_m}(t)$ over n-th frame
time

FIG. 36

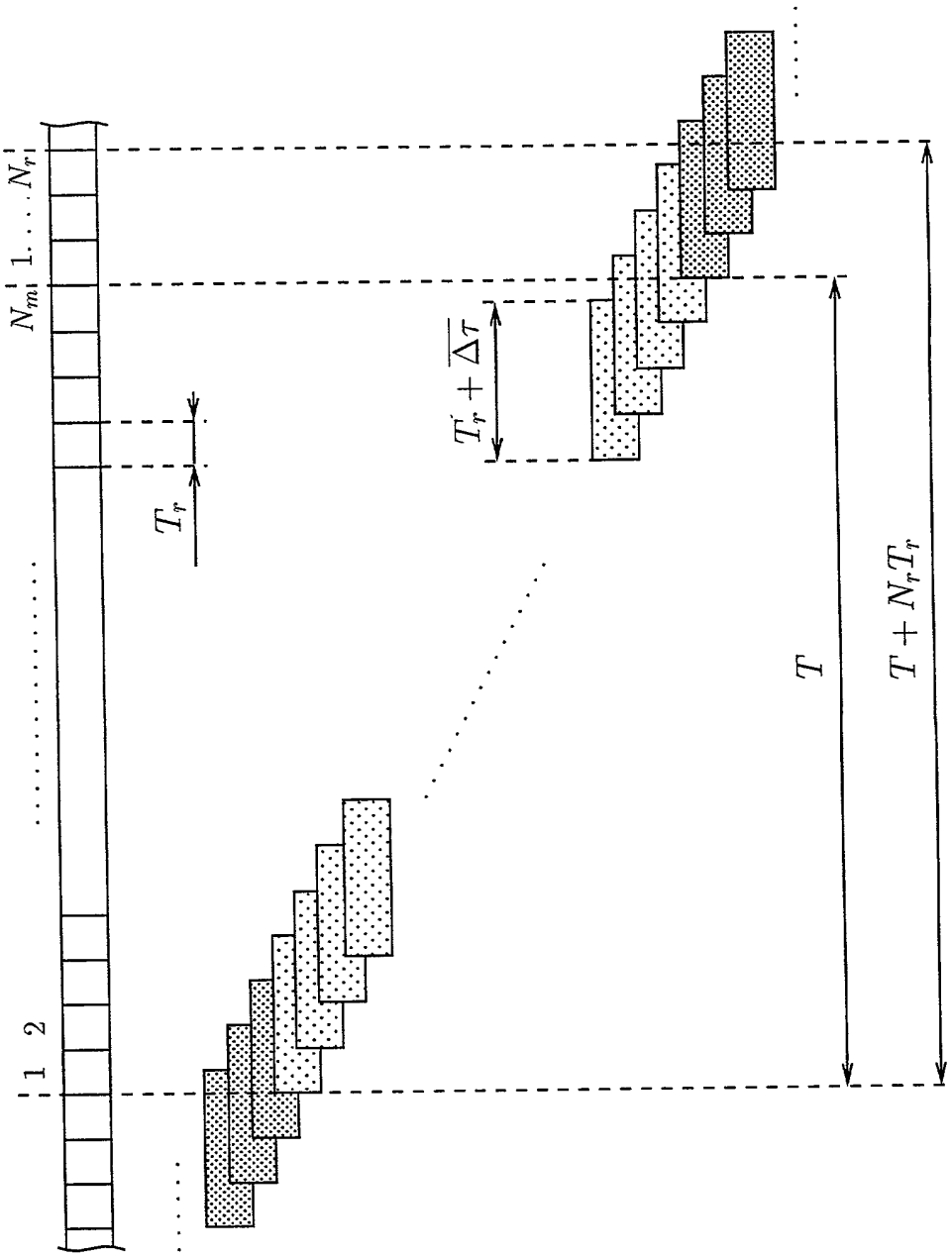


FIG. 37

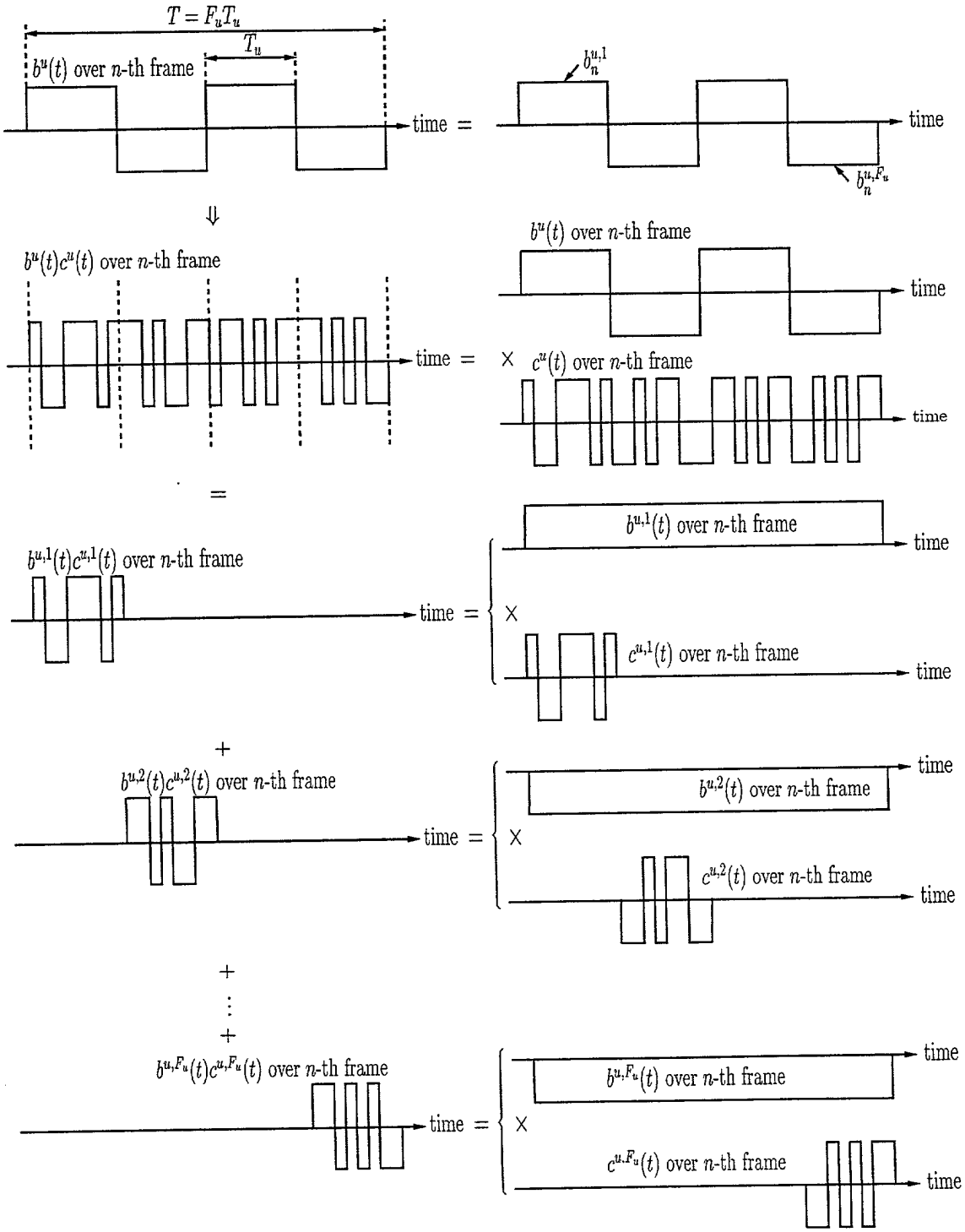

$T = F_u T_u$
T_u
$b^u(t)$ over n-th frame
time =
$b_n^{u,1}$
b_n^{u,F_u}
time
$b^u(t)c^u(t)$ over n-th frame
$b^u(t)$ over n-th frame
$c^u(t)$ over n-th frame
$b^{u,1}(t)c^{u,1}(t)$ over n-th frame
$b^{u,1}(t)$ over n-th frame
$c^{u,1}(t)$ over n-th frame
$b^{u,2}(t)c^{u,2}(t)$ over n-th frame
$b^{u,2}(t)$ over n-th frame
$c^{u,2}(t)$ over n-th frame
$b^{u,F_u}(t)c^{u,F_u}(t)$ over n-th frame
$b^{u,F_u}(t)$ over n-th frame
$c^{u,F_u}(t)$ over n-th frame

FIG. 38

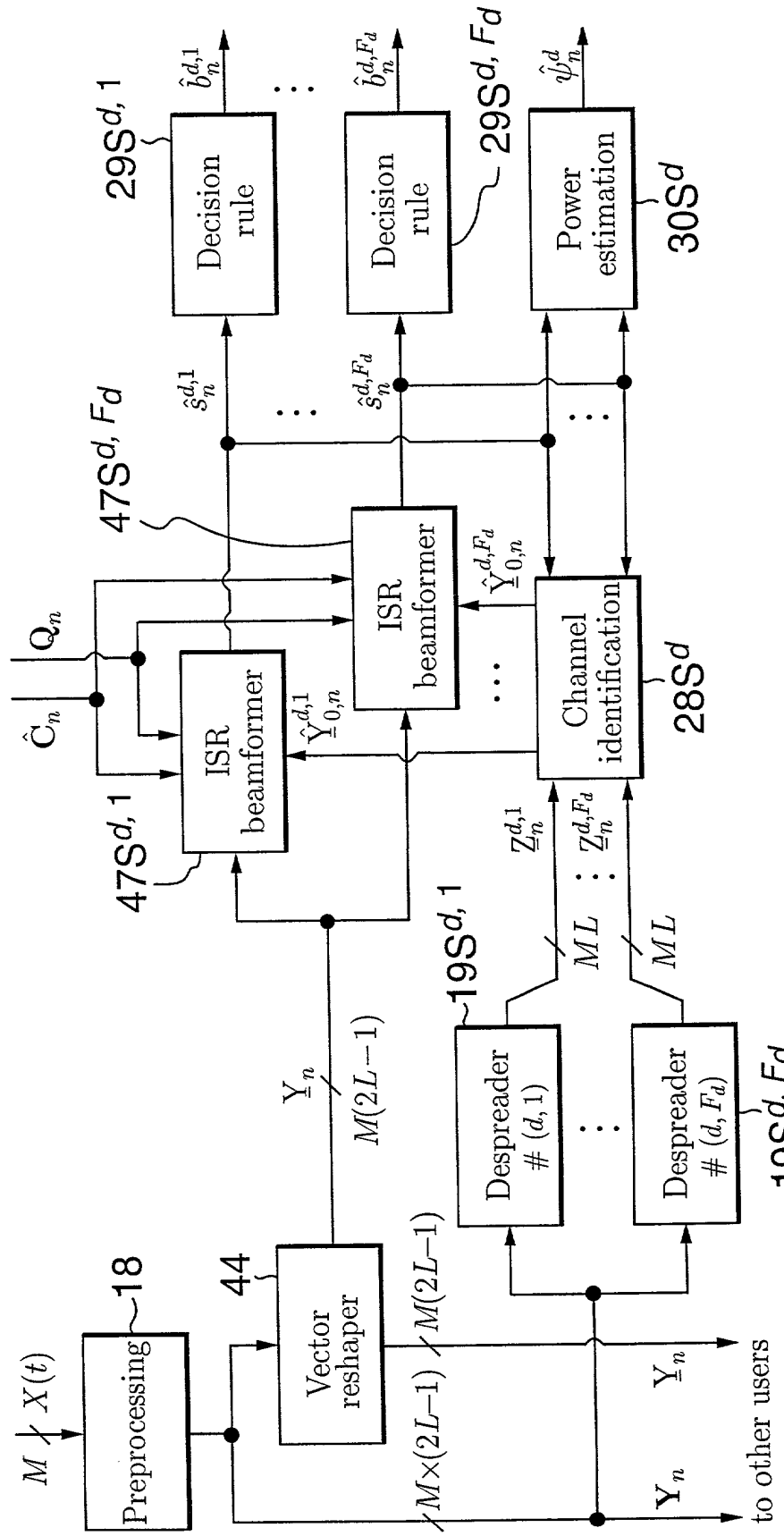

M
X(t)
Preprocessing
18
44
Vector reshaper
M×(2L−1)
M(2L−1)
Y_n
Y_n
to other users
19S^d, 1
Despreader # (d, 1)
19S^d, Fd
Despreader # (d, Fd)
ML
ML
Z_n^{d,1}
Z_n^{d,Fd}
28S^d
Channel identification
47S^d, 1
ISR beamformer
47S^d, Fd
ISR beamformer
Ĉ_n
Q_n
Ŷ_{0,n}^{d,1}
Ŷ_{0,n}^{d,Fd}
ŝ_n^{d,1}
ŝ_n^{d,Fd}
29S^d, 1
Decision rule
29S^d, Fd
Decision rule
30S^d
Power estimation
b̂_n^{d,1}
b̂_n^{d,Fd}
ψ̂_n^d

FIG. 39

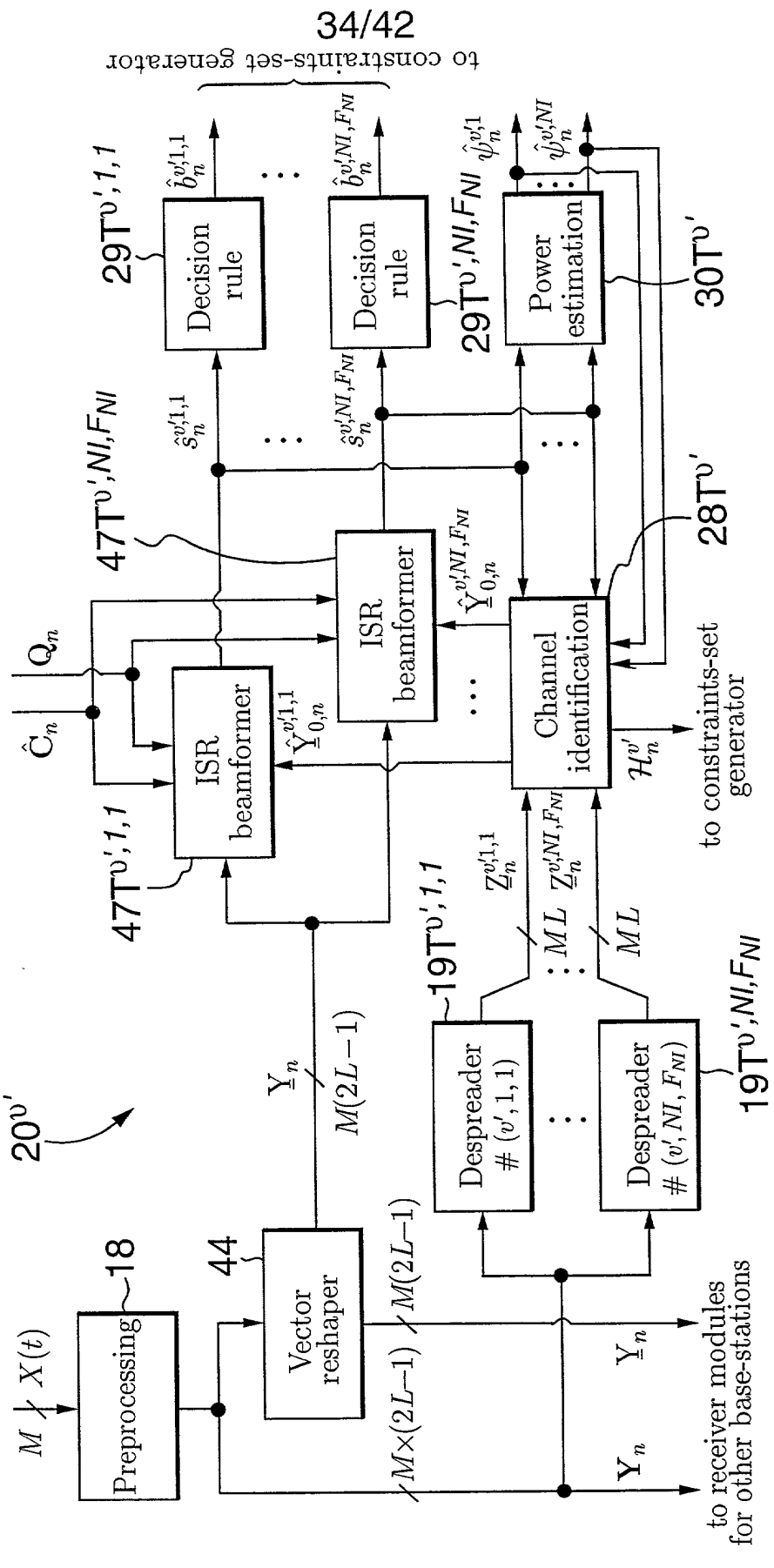

to constraints-set generator
29T$^{\upsilon',1,1}$
29T$^{\upsilon',NI,F_{NI}}$
30T$^{\upsilon'}$
47T$^{\upsilon',NI,F_{NI}}$
47T$^{\upsilon',1,1}$
28T$^{\upsilon'}$
19T$^{\upsilon',1,1}$
19T$^{\upsilon',NI,F_{NI}}$
20$^{\upsilon'}$
44
18
Decision rule
Decision rule
Power estimation
ISR beamformer
ISR beamformer
Channel identification
Despreader # (υ',1,1)
Despreader # (υ',NI,F_{NI})
Vector reshaper
Preprocessing
$\hat{b}_n^{\upsilon',1,1}$
$\hat{b}_n^{\upsilon',NI,F_{NI}}$
$\hat{\psi}_n^{\upsilon',1}$
$\hat{\psi}_n^{\upsilon',NI}$
$\hat{s}_n^{\upsilon',1,1}$
$\hat{s}_n^{\upsilon',NI,F_{NI}}$
$\hat{Y}_{0,n}^{\upsilon',1,1}$
$\hat{Y}_{0,n}^{\upsilon',NI,F_{NI}}$
$\hat{C}_n$
Q_n
$\underline{Y}_n$
$M(2L-1)$
$Z_n^{\upsilon',1,1}$
$Z_n^{\upsilon',NI,F_{NI}}$
ML
$\mathcal{H}_n^{\upsilon'}$
to constraints-set generator
$M \times (2L-1)$
$M(2L-1)$
$\mathbf{Y}_n$
$\underline{Y}_n$
$M \nearrow X(t)$
to receiver modules for other base-stations

FIG. 40

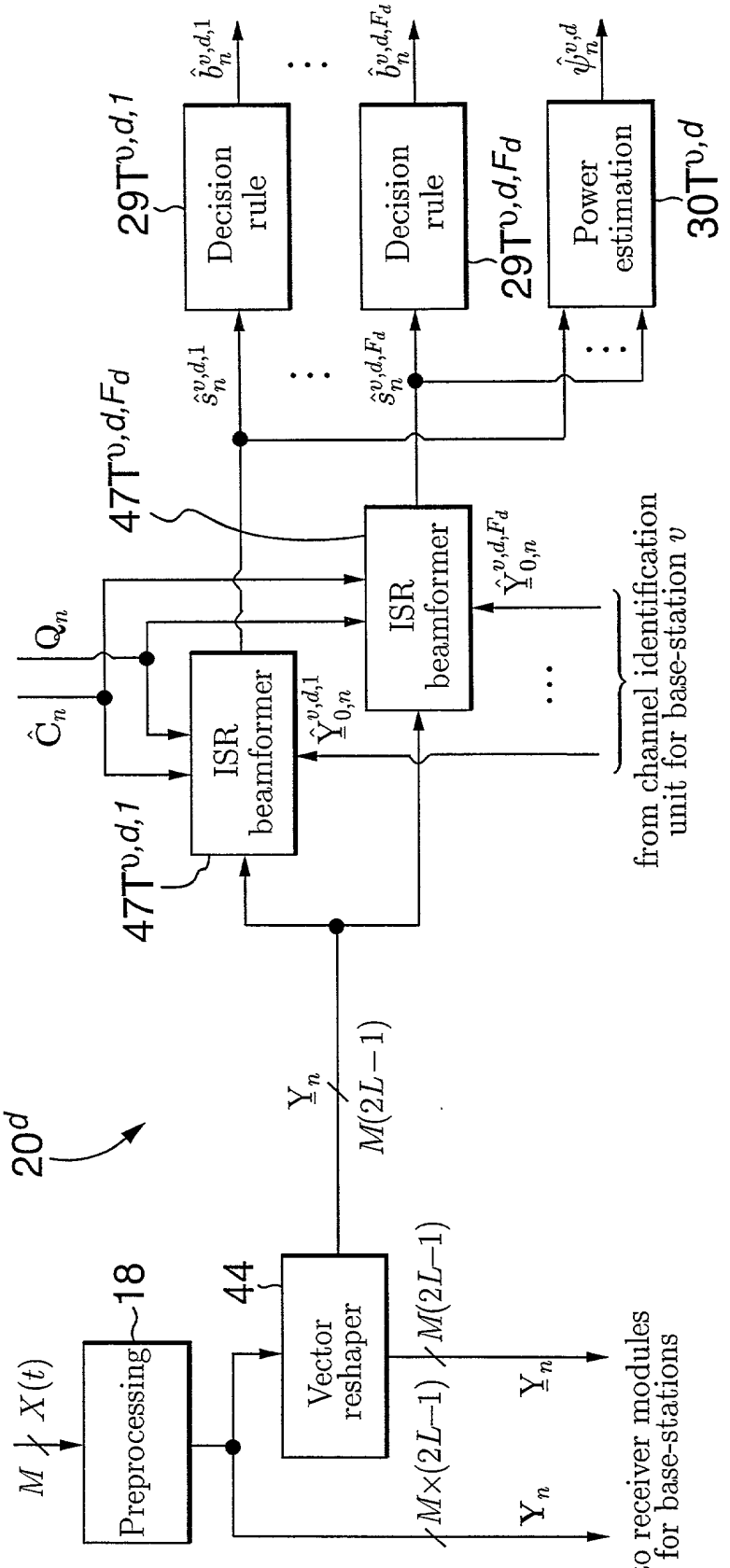

20^d
M
X(t)
Preprocessing
18
44
Vector reshaper
M×(2L−1)
M(2L−1)
Y_n
Y_n
to receiver modules for base-stations
Y_n
M(2L−1)
47T^{v,d,1}
47T^{v,d,F_d}
Ĉ_n
Q_n
ISR beamformer
ISR beamformer
Ŷ^{v,d,1}_{0,n}
Ŷ^{v,d,F_d}_{0,n}
from channel identification unit for base-station v
29T^{v,d,1}
29T^{v,d,F_d}
Decision rule
Decision rule
Power estimation
30T^{v,d}
ŝ^{v,d,1}_n
ŝ^{v,d,F_d}_n
b̂^{v,d,1}_n
b̂^{v,d,F_d}_n
ψ̂^{v,d}_n

FIG. 41

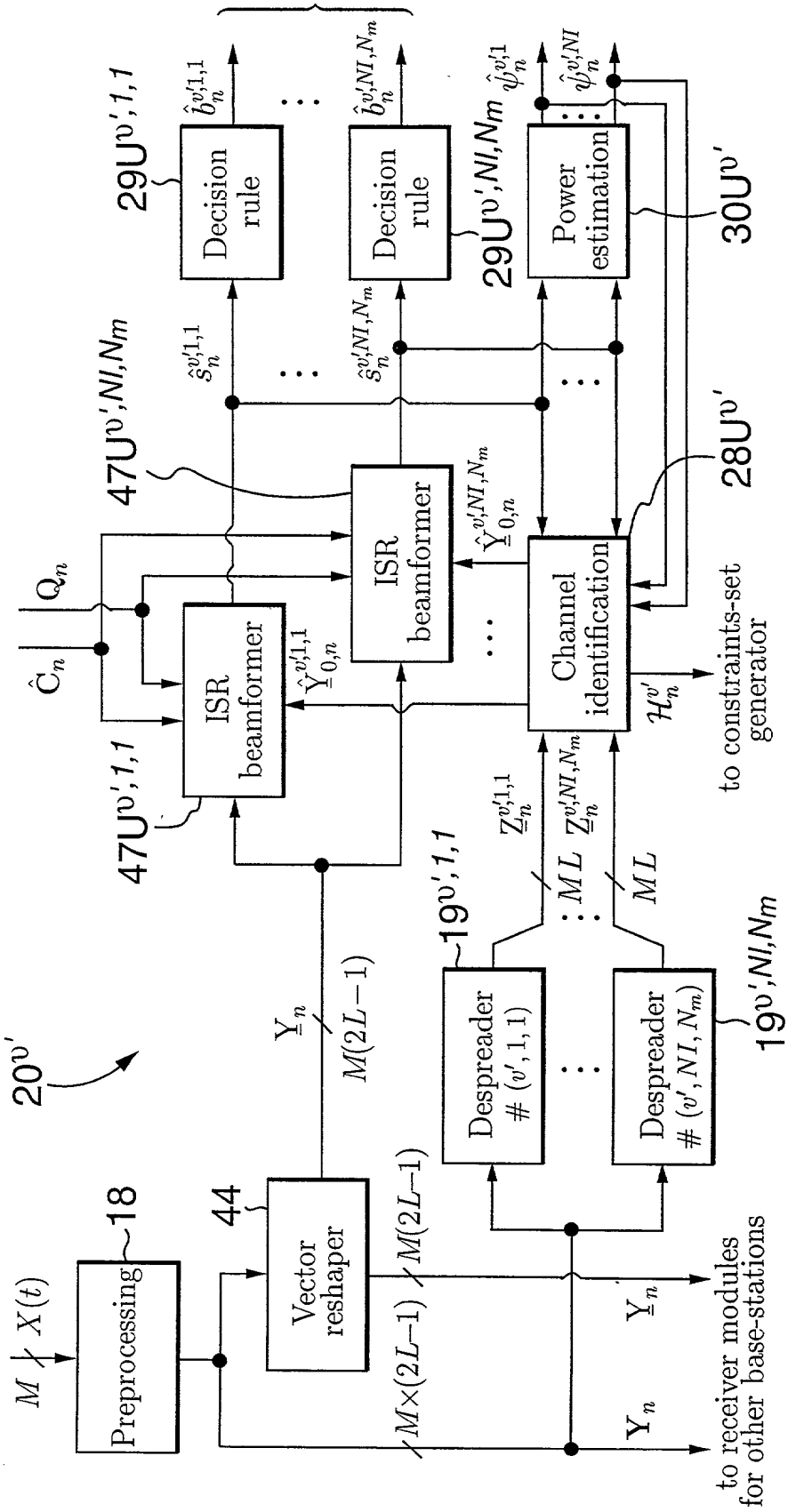

to constraints-set generator
20υ'
M
X(t)
Preprocessing
18
44
Vector reshaper
M×(2L−1)
M(2L−1)
Y_n
to receiver modules for other base-stations
Despreader # (υ', 1, 1)
Despreader # (υ', NI, N_m)
19υ',1,1
19υ',Nl,Nm
ML
Z_n^{υ',1,1}
Z_n^{υ',NI,N_m}
47υ',1,1
47υ',Nl,Nm
ISR beamformer
ISR beamformer
Ĉ_n
Q_n
Ŷ_{0,n}^{υ',1,1}
Ŷ_{0,n}^{υ',NI,N_m}
Channel identification
H_n^{υ'}
28υ'
to constraints-set generator
Decision rule
Decision rule
29υ',1,1
29υ',Nl,Nm
ŝ_n^{υ',1,1}
ŝ_n^{υ',NI,N_m}
b̂_n^{υ',1,1}
b̂_n^{υ',NI,N_m}
Power estimation
30υ'
ψ̂_n^{υ',1}
ψ̂_n^{υ',NI}

FIG. 42

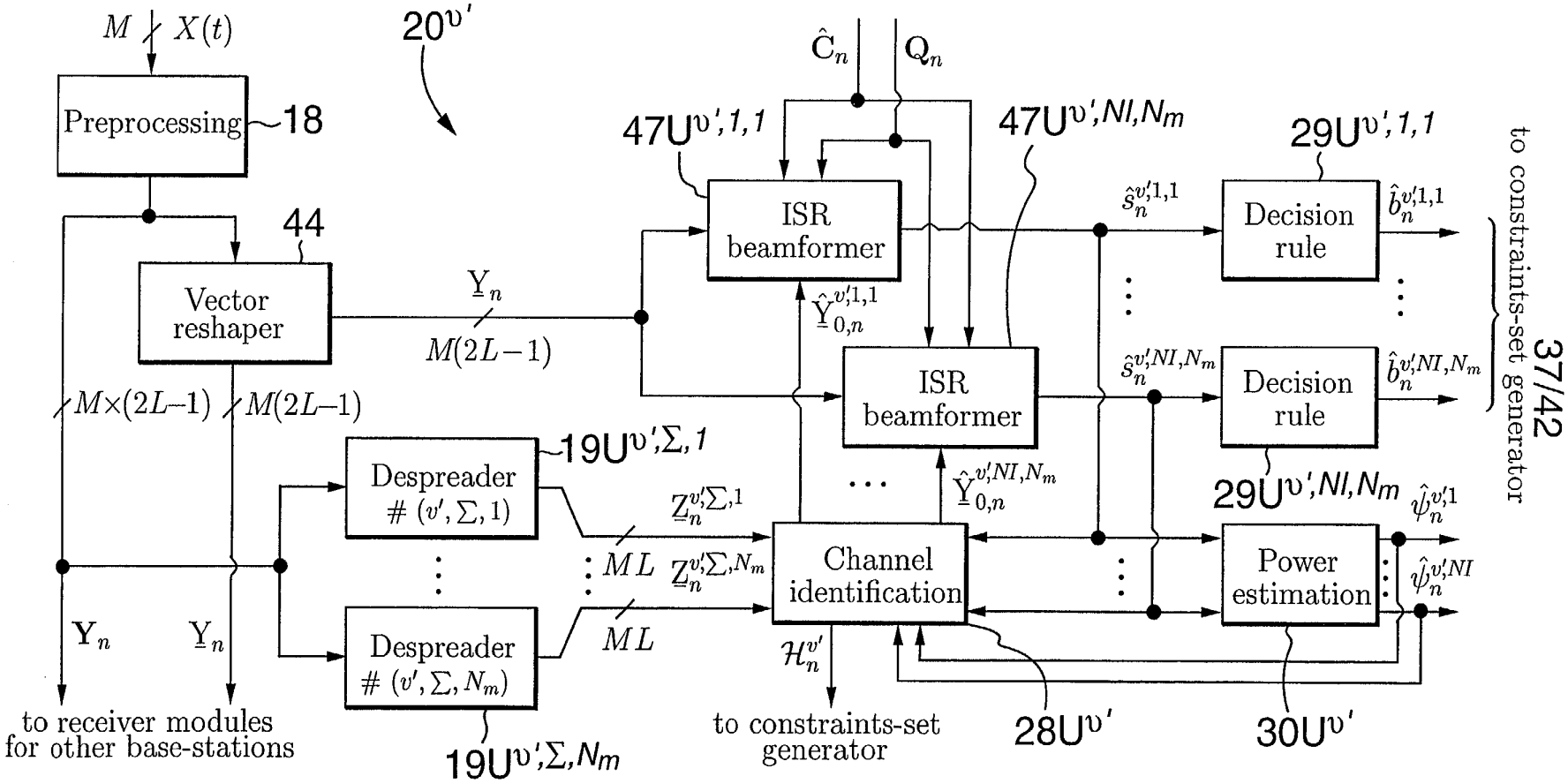

M X(t)
Preprocessing
18
20υ'
Ĉn
Qn
47Uυ',1,1
47Uυ',NI,Nm
29Uυ',1,1
44
Vector reshaper
Yn
M(2L−1)
ISR beamformer
ISR beamformer
Decision rule
Decision rule
37/42
to constraints-set generator
M×(2L−1)
M(2L−1)
19Uυ',Σ,1
Despreader # (υ', Σ, 1)
Despreader # (υ', Σ, Nm)
19Uυ',Σ,Nm
ML
Channel identification
Power estimation
29Uυ',NI,Nm
28Uυ'
30Uυ'
to receiver modules for other base-stations
to constraints-set generator

FIG. 43

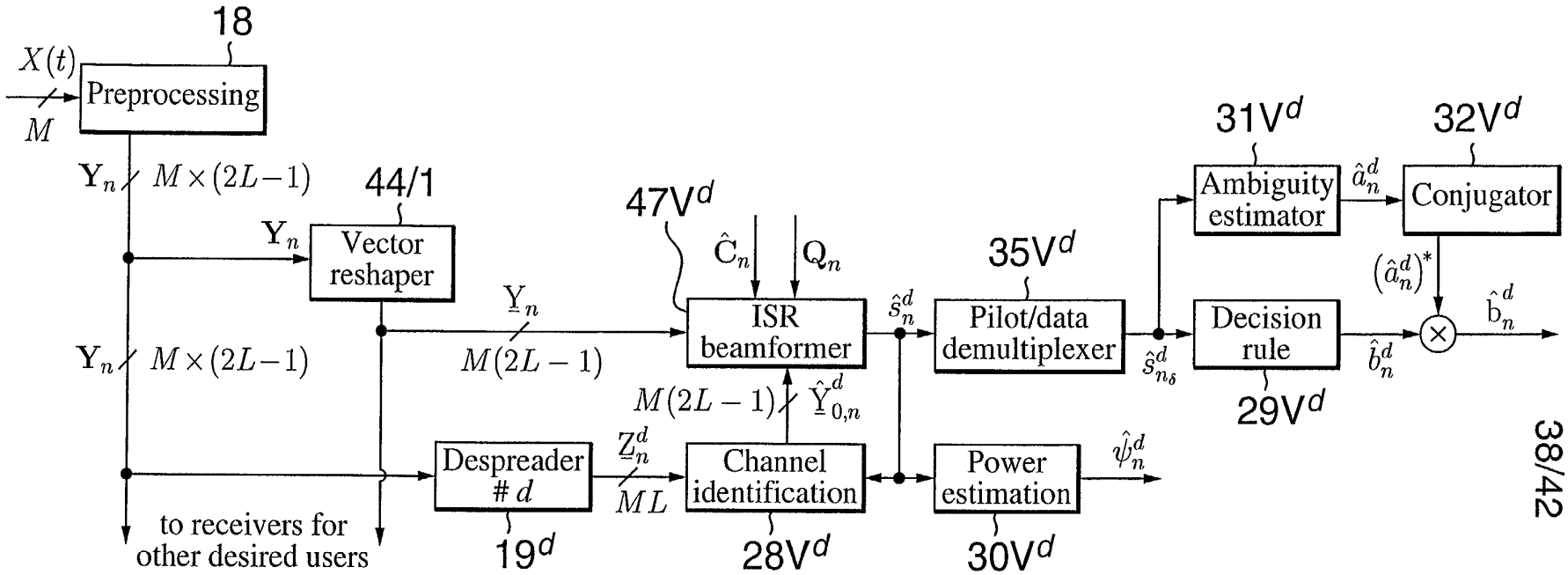


FIG. 44

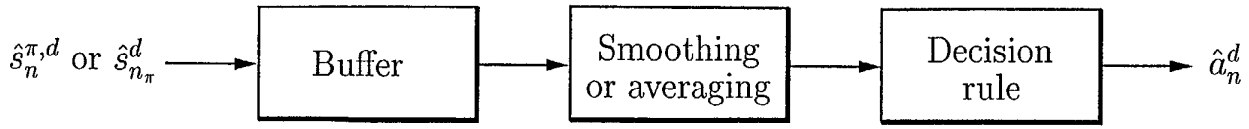


FIG. 45

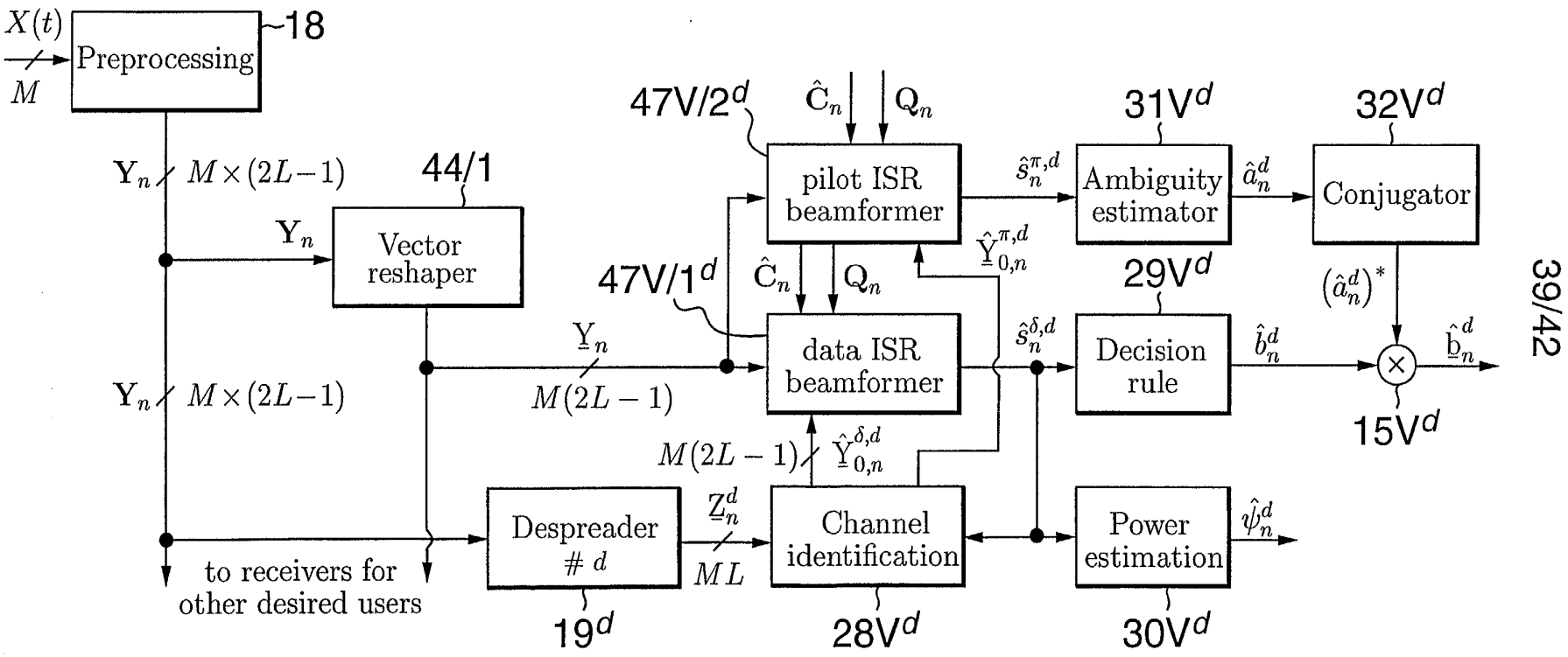

X(t)
M
Preprocessing
18
Y_n
M×(2L−1)
44/1
Vector reshaper
47V/2^d
Ĉ_n
Q_n
pilot ISR beamformer
31V^d
Ambiguity estimator
32V^d
Conjugator
47V/1^d
data ISR beamformer
29V^d
Decision rule
15V^d
M(2L−1)
Despreader # d
19^d
ML
Channel identification
28V^d
Power estimation
30V^d
to receivers for other desired users

FIG. 46

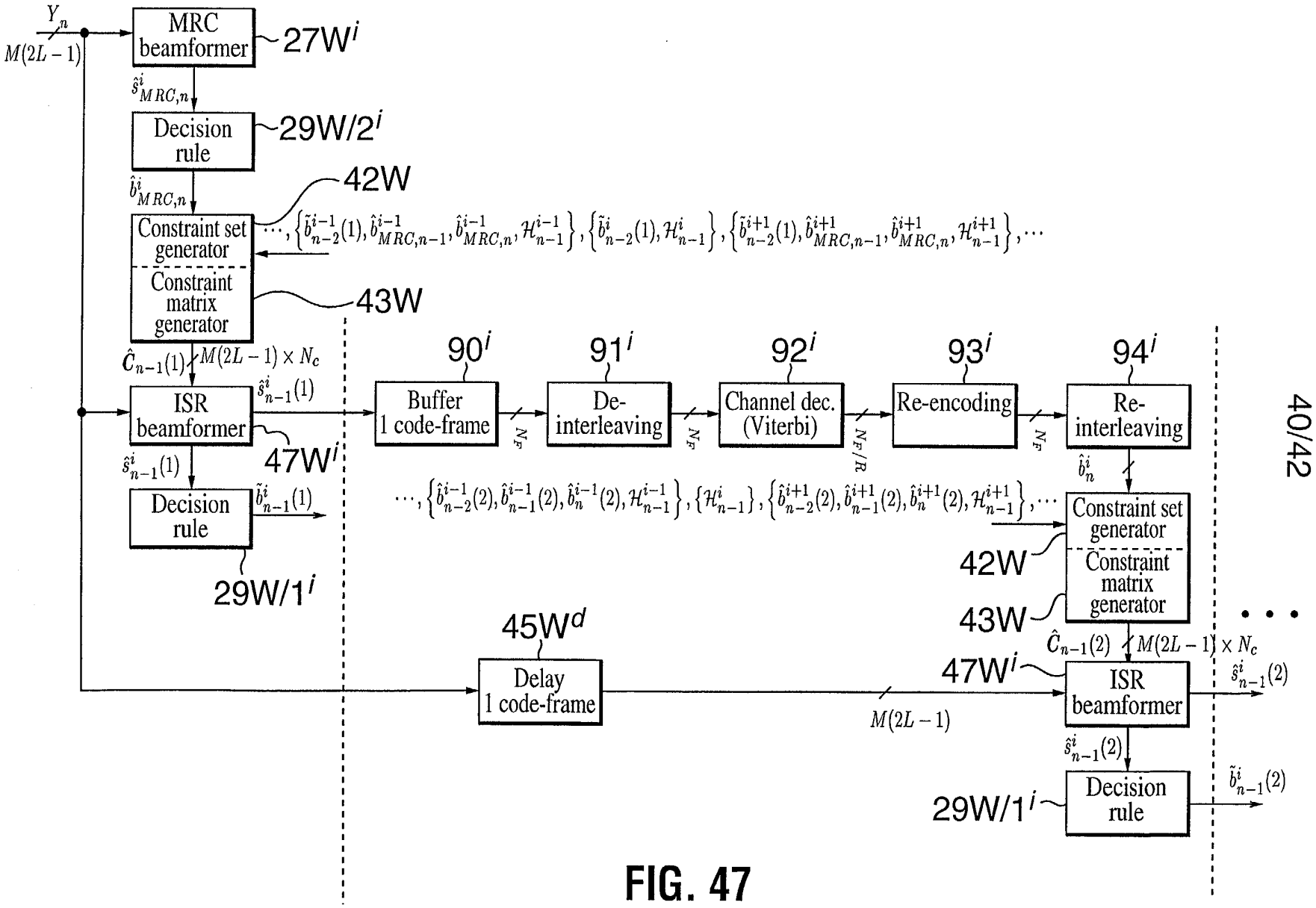

MRC beamformer
27W^i
Decision rule
29W/2^i
42W
Constraint set generator
Constraint matrix generator
43W
ISR beamformer
47W^i
Decision rule
29W/1^i
90^i
Buffer 1 code-frame
91^i
De-interleaving
92^i
Channel dec. (Viterbi)
93^i
Re-encoding
94^i
Re-interleaving
Constraint set generator
Constraint matrix generator
ISR beamformer
Decision rule
45W^d
Delay 1 code-frame

FIG. 47

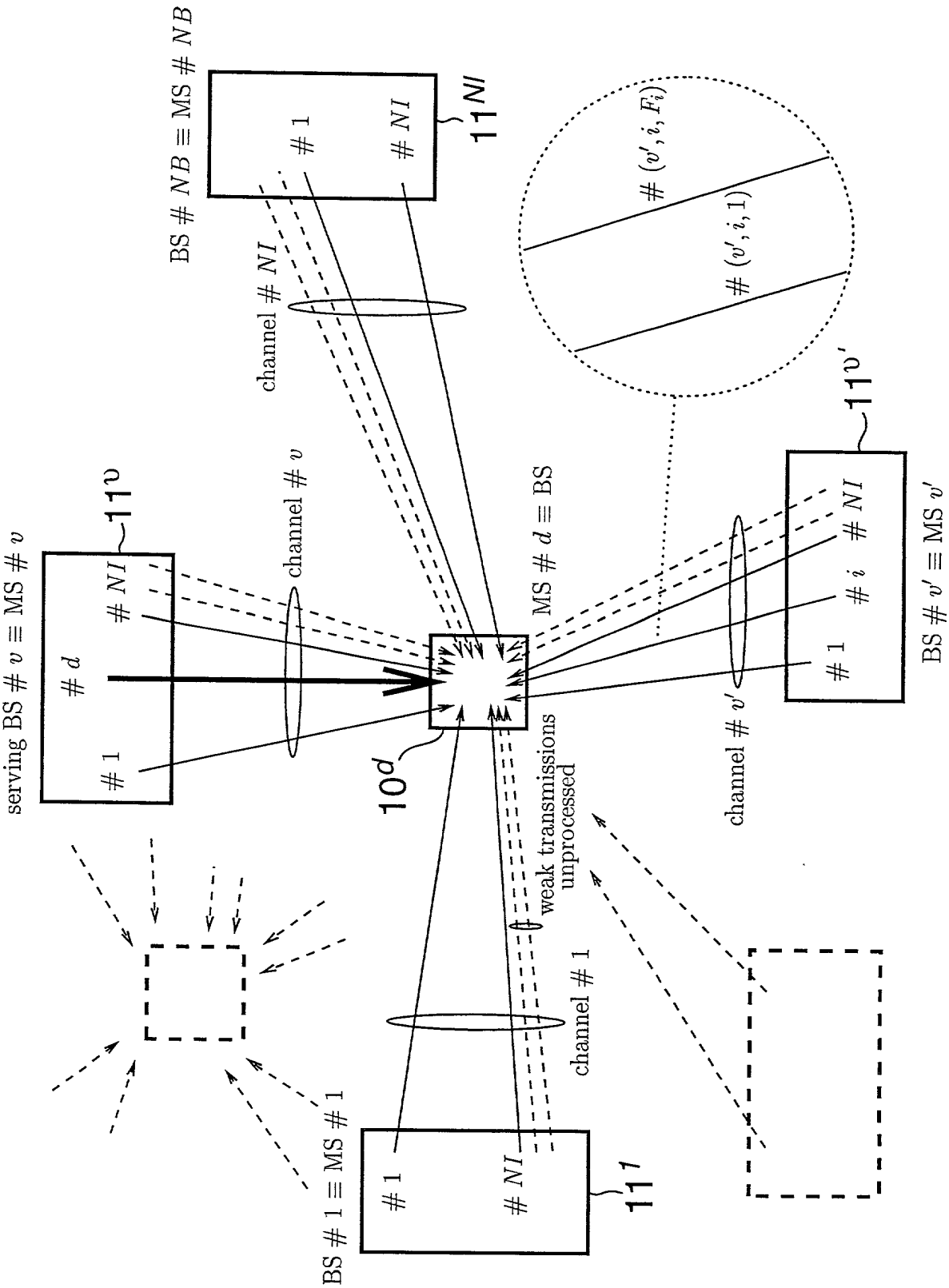

BS # NB ≡ MS # NB
1
NI
11^NI
channel # NI
channel # v
serving BS # v ≡ MS # v
d
1
NI
11^υ
10^d
MS # d ≡ BS
weak transmissions unprocessed
channel # 1
BS # 1 ≡ MS # 1
1
NI
11^1
(v', i, F_i)
(v', i, 1)
channel # v'
1
i
NI
11^υ'
BS # v' ≡ MS v'

FIG. 48

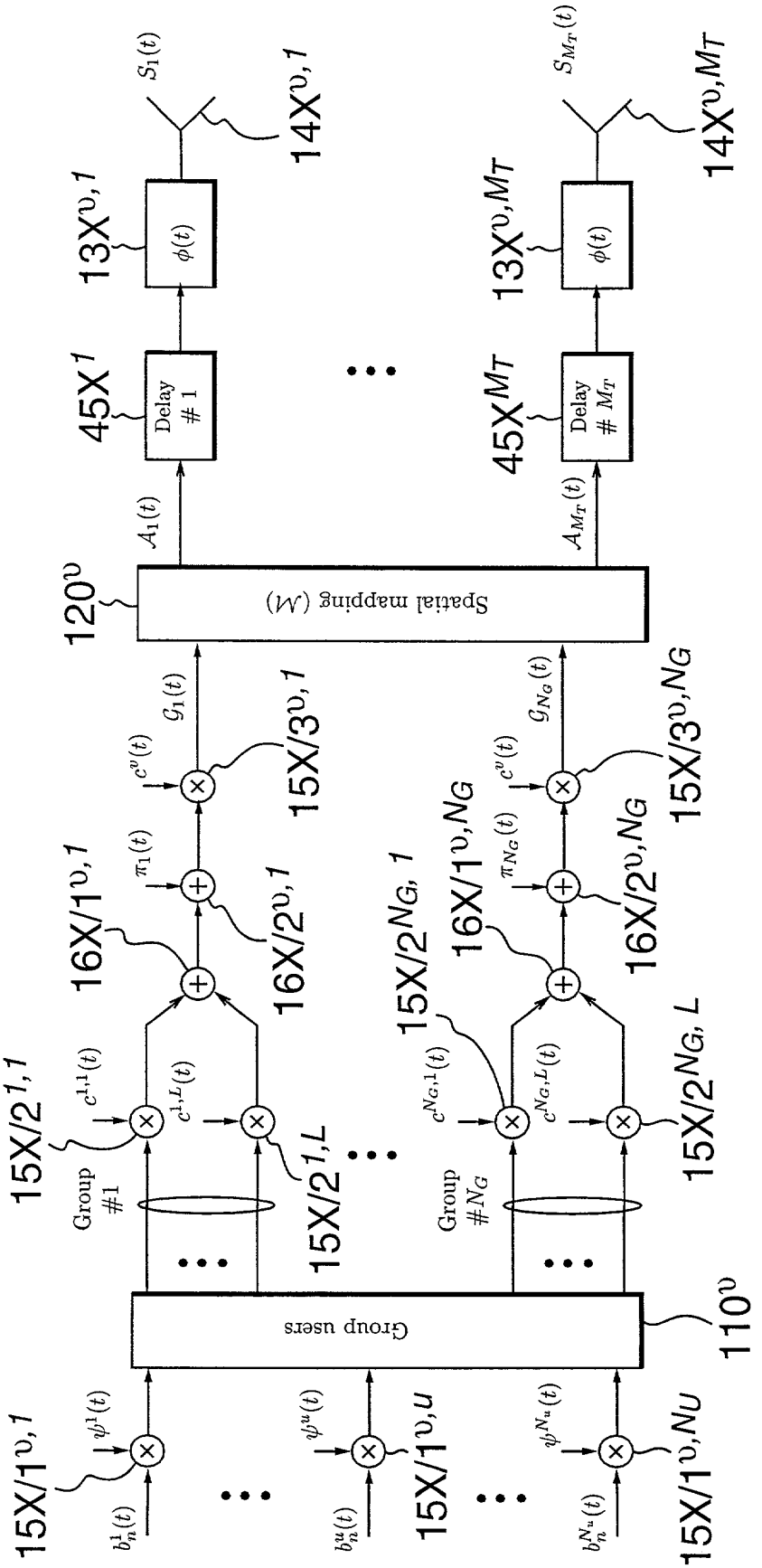

Group users
Spatial mapping ($\mathcal{M}$)
Delay # 1
Delay # M_T
Group #1
Group #N_G
$\phi(t)$
$\phi(t)$
$S_1(t)$
$S_{M_T}(t)$
$\mathcal{A}_1(t)$
$\mathcal{A}_{M_T}(t)$
$\mathcal{G}_1(t)$
$\mathcal{G}_{N_G}(t)$
$\pi_1(t)$
$\pi_{N_G}(t)$
$c^v(t)$
$c^{1,1}(t)$
$c^{1,L}(t)$
$c^{N_G,1}(t)$
$c^{N_G,L}(t)$
$\psi^1(t)$
$\psi^u(t)$
$\psi^{N_u}(t)$
$b_n^1(t)$
$b_n^u(t)$
$b_n^{N_u}(t)$
$15X/1^{v,1}$
$15X/1^{v,u}$
$15X/1^{v,N_U}$
$15X/2^{1,1}$
$15X/2^{1,L}$
$15X/2^{N_G,1}$
$15X/2^{N_G,L}$
$16X/1^{v,1}$
$16X/1^{v,N_G}$
$16X/2^{v,1}$
$16X/2^{v,N_G}$
$15X/3^{v,1}$
$15X/3^{v,N_G}$
$45X^1$
$45X^{M_T}$
$13X^{v,1}$
$13X^{v,M_T}$
$14X^{v,1}$
$14X^{v,M_T}$
110^v
120^v

FIG. 49